Graduate Program Review
2009-2014

Geosciences
Jeff Lee, Chair

College of
Arts and Sciences
Brent Lindquist, Dean
I. Program Overview – A one to two-page summary of department’s vision and goals.

II. Graduate Curricula and Degree Programs

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B. Number and types of degrees awarded
   - Degrees Awarded – Fiscal Year (chart & table)
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   - Summary of Number of Proposals Written (table)
   - Summary of Number of Proposals Accepted (table)
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   - Research Expenditures (chart & table)
   - Peer Institution Info (table)
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I. Centers or Institutes
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VII. **Appendices** – should include, but not be limited to, the following:

Table of Contents
A. Strategic plan
   - Attachment from Strategic Planning website

C. Curriculum Map (table)
D. 18 Characteristics
E. Graduate Course Offerings (table)
F. Graduate Student Handbook
G. Graduate Student Association(s) – Description and Information
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I. **Program Overview**

The Texas Tech University (TTU) Department of Geosciences vision is to achieve the highest standards of excellence in all aspects of teaching, research, and service. It recognizes that the subdisciplines of the Geosciences serve as the basis for any fundamental understanding of environmental processes, natural resources, and natural hazards. These subdisciplines include Geology, Geophysics, Atmospheric Science and Geography. As such, the Department strives to maintain a faculty that is recognized nationally and internationally for their research and teaching contributions and to maintain our existing and emerging programmatic strengths. Our goal is to build a foundation for healthy, long-term scientific enterprise that focuses on transformational shifts in understanding, conveyed to students in classroom and research settings. We seek to educate students to become scientists who can use their skills in industry, academia, and as citizens.

The Department has several parts. Atmospheric Sciences has 7 tenure/tenure track faculty and 2 instructors. Geography has 4.5 tenure/tenure track (one split with Honors College) and 3 instructors. (Plus a University President, not involved in departmental teaching and a half time Research Professor.) Geology and Geophysics have 13.5 tenure/tenure track (one split with Museum Studies), one emeritus professor teaching part time, and no instructors. This totals 25.5 faculty involved in the Graduate Program. Geography joined the department in 2011.

Research areas run the spectrum of the various disciplines represented in the Department, but there are clear strengths in severe storms and geochemistry.

For teaching, Atmospheric Sciences has an MS and no undergraduate major. Geography has an MS, a BA, and a Graduate Certificate in Geographic Information Science and Technology. There are MS, BA, and BS in Geosciences, with concentrations in Geophysics and Geology in the BS. The PhD in Geosciences is used by all areas of the department. (There is some confusion in the term Geosciences, sometimes referring to the Department and sometimes to the Geology and Geophysics parts of the Department.) The MS in Geography began in 2012. The MS has dominated graduate education in the department as it is the ‘industry standard’ in the oil and gas industries, environmental consulting, and both public and private meteorology employers. The number of students pursuing the PhD has increased in recent years.

Research facilities include meteorology instrumentation labs, several geochemistry labs, microscopy facilities, and GIS/remote sensing labs. Closely tied to the Department but run by the College are the Imaging Center and Center for Geospatial Technology. The University High Performance Computing Facility is used by various faculty members in the Department.
Space is a continuing issue for the Department. Faculty offices are in three buildings and research facilities are in two more (one ~10 miles from campus). Geology and Geophysics and the Department office are in a 1950s building sorely in need of modernization.
II. Graduate Curricula and Degree Programs

A. Scope of programs within the department

The Department of Geosciences has four graduate programs: MS in Atmospheric Sciences, MS in Geosciences, MS in Geography, and PhD in Geosciences. All MS programs require a thesis and the PhD requires a comprehensive examination and a dissertation. The MS in Atmospheric Sciences requires 30 hours of coursework, 4 hours of seminar, and 6 hours of thesis. MS in Geosciences requires 36 hours, of which at least 24 must be in coursework and 6 in thesis. The MS in Geography has two required classes (Geographic Thought and Research Methods), 12 hours of coursework in the major, 6 in a minor, and 6 of thesis. The PhD requires a proposal defense, comprehensive exams, a tool, and a dissertation.

There is a Graduate Certificate in Geographic Information Science and Technology, requiring Advanced GIS, Spatial Analysis and Modeling, and two electives.

B. Number and types of degrees awarded

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*Source: IR*
Degrees Awarded - Fiscal Year (GEOG)
Source: Institutional Research
Chart Prepared by the Graduate School

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*Source: IR*
Degrees Awarded - Fiscal Year (GEOS)

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Chart Prepared by the Graduate School

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*Source: IR*
C. What is your department or program doing in respect to Low Preforming Programs (LPP) as defined by the Texas Higher Education Coordinating Board (04.10.1).
(http://www.depts.ttu.edu/oppol/Chapter04.pdf)

The PhD in Geosciences is low performing, based on the number of completed degrees in the past five years. In Geology/Geophysics and Atmospheric Sciences, almost all graduate students intend to go into industry (mostly oil and gas and wind power) or the National Weather Service and the MS is the desired degree for these professions. We are one student short of the ten needed over the past five years to meet State standards. We see this as a temporary setback and anticipate a greater number of graduates for the following reasons. 1) Geography now is adding to the numbers, with five current PhD students. 2) After a several year vacancy in our Pevehouse Chair

Geosciences
position, we hired Dr. Paul Sylvester and he has already recruited several PhD students. 3) With a greater push on all faculty to recruit and mentor PhD students, we are increasing the number of PhD students across the department, currently at 23.

The Geography MS likely is to be listed as low performing, when it officially is evaluated by the state. Since the program began in Fall 2011, there have been seven graduates, well short of the five per year average required of a Master’s program. This partly is due to growing pains in establishing a new program and attracting large numbers of applicants. Another issue is attrition of students who quit the program or switch to Interdisciplinary Studies in order to finish more quickly. Also involved is the loss of faculty lines that have not been replaced. Dr. Zhe Zhu will join the faculty in Fall 2016. In addition, a non-thesis option is being developed for the program.
D. Undergraduate and graduate semester credit hours

![Graph showing department semester credit hours from 2009 to 2014.](chart.png)

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*Source: IR*
AY SCH Compared to Budget
(GEOS)
Source: Institutional Research
Chart Prepared by the Graduate School

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*Source: IR

**AFISM
E. Number of majors in the department for the fall semesters

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*Source: IR*
Enrollment by Level - Fall Data (GEOG)

Source: Institutional Research
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*Source: IR*
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*The source for data is from the Peer Institutions but Texas Tech data is from IR*
Course Enrollments by Academic Year

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F. Course enrollments over the past six years (enrollment trends by course)
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Geosciences
G. Courses cross listed (TANDEM) (UG and Grad – need syllabus in appendix J for both UG and Grad individual courses)

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III. Faculty

A. Number, rank, and demographics of the graduate faculty (tenure and tenure track), GPTI’s and TA’s

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Geosciences
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*Data comes from peer institutions but Texas Tech data comes from IR*
### List of Faculty Members

*List all faculty who were employed by your department during the six years of this review*

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C. Summary of the number of refereed publications and creative activities.

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N = # of full time faculty contributing  F = # of full time faculty in department

Source: The Department

D. Responsibilities and leadership in professional societies

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Source: The Department
## Student Committee Service

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Sweet, Dustin | 5 | 1 | 9 | 1 | 0 | 0 | 18
Vanos, Jennifer | 4 | 0 | 1 | 1 | 0 | 0 | 0
Weiss, Chris | 9 | 4 | 13 | 2 | 1 | 2 | 2
Yoshinobu, Aaron | 12 | 2 | 6 | 2 | 0 | 1 | 12

*Source: The Department*

E. Assess average faculty productivity for Fall semesters only (use discipline appropriate criteria to determine)

**FACULTY WORKLOAD**
*Source: Institutional Research*
Table Prepared by the Graduate School

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College SCH/FTE - Fall Data
(College of Arts and Sciences)
Source: Institutional Research
Chart Prepared by the Graduate School

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*Source: IR*
### Department SCH/FTE - Fall Data (GEOS)

Source: Institutional Research  
Chart Prepared by the Graduate School

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*Source: IR*
IV. Graduate Students

A. Applicants and enrolled students

- **Graduate Student Summary by Category - Fall Data (ATMO)**
  - Chart prepared by the Graduate School

- **Table: Graduate Student Summary by Category - Fall Data (ATMO)**

<table>
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<tr>
<th>Year</th>
<th>Total Applicants</th>
<th>Total Admitted</th>
<th>New Grad Students</th>
<th>Students Graduated</th>
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<tbody>
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<td>2009</td>
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*Source: IR

**Students Graduated data is by Academic Year**
Graduate Student Summary by Category - Fall Data
(GEOG)

Source: Institutional Research
Chart Prepared by the Graduate School

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*Source: IR*
**Students Graduated data is by Academic Year**
Graduate Student Summary by Category - Fall Data
(GEOS)

Source: Institutional Research
Chart Prepared by the Graduate School

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<th>2013</th>
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*Source: IR

**Students Graduated data is by Academic Year
Graduate Applicants by Region - Fall Data (ATMO)
Source: Institutional Research
Charp Prepared by the Graduate School

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*Source: IR*
Graduate Applicants by Region - Fall Data
(GEOG)
Source: Institutional Research
Chap Prepared by the Graduate School

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*Source: IR*
Graduate Applicants by Region - Fall Data (GEOS)

Source: Institutional Research
Chart Prepared by the Graduate School

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*Source: IR
### Atmospheric Science

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*Source: JR*

### Enrolled New Graduate Students - Fall Data

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*Source: JR*

### Admitted Graduate Students - Fall Data

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*Source: JR*

### Demographics of Enrolled Graduate Students - Fall Data

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*Source: JR*
# Geography

## Graduate Applicants - Fall Data

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*Source: JR*

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*Source: JR*

## Enrolled New Graduate Students - Fall Data

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*Source: JR*

## Demographics of Enrolled Graduate Students - Fall Data

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*Source: JR*
### Geosciences

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*Source: IR*
Comparison of Students 
Applied/Admitted/Enrolled - Fall Data 
(GEOS) 
Source: COGNOS 
Chart Prepared by the Graduate School 

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*Source: COGNOS 
*Table reflects fall data
Comparison of Students
Applied/Admitted/Enrolled - Fall Data
(College of Arts and Sciences)
Source: COGNOS
Chart Prepared by the Graduate School

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<td>39%</td>
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| Admitted   | 402  | 404  | 322  | 262  | 338  | 539  | 534  |
| Enrolled   | 367  | 376  | 285  | 236  | 304  | 334  | 357  |
| % Enrolled from Admitted | 91%  | 93%  | 89%  | 90%  | 90%  | 62%  | 67%  |

% Enrolled from Applied
| 69% | 64% | 59% | 57% | 71% | 24% | 25% |

*Source: COGNOS*

*Table reflects fall data*
Comparison of Students
Applied/Admitted/Enrolled - Fall Data
(Texas Tech University)
Source: COGNOS
Chart Prepared by the Graduate School

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<td>2927</td>
<td>2336</td>
<td>2176</td>
<td>2130</td>
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<tr>
<td>Admitted</td>
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<td>2095</td>
<td>1599</td>
<td>1575</td>
<td>1768</td>
<td>2827</td>
<td>2512</td>
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<tr>
<td>% Admitted from Applied</td>
<td>77%</td>
<td>72%</td>
<td>68%</td>
<td>72%</td>
<td>83%</td>
<td>46%</td>
<td>39%</td>
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<tr>
<td>Admitted</td>
<td>2158</td>
<td>2095</td>
<td>1599</td>
<td>1575</td>
<td>1768</td>
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<td>2512</td>
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<td>Enrolled</td>
<td>1953</td>
<td>1920</td>
<td>1406</td>
<td>1352</td>
<td>1588</td>
<td>1746</td>
<td>1652</td>
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<tr>
<td>% Enrolled from Admitted</td>
<td>91%</td>
<td>92%</td>
<td>88%</td>
<td>86%</td>
<td>90%</td>
<td>62%</td>
<td>66%</td>
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*Source: COGNOS
*Table reflects fall data.
B. GRE (see appendix h)
Average GRE Scores for Enrolled Graduate Students - Fall Data (GEOG)

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<th>Fall 2012</th>
<th>Fall 2013</th>
<th>Fall 2014</th>
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<td></td>
<td>Prior Scale (200-800)</td>
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<tr>
<td>Quantitative</td>
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<td>154</td>
<td>155</td>
<td>150</td>
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<tr>
<td></td>
<td>Prior Scale (200-800)</td>
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</table>

Chart prepared by the Graduate School

Geosciences
C. GPA of new students

New Graduate Student GPA by Level - Fall Data
(ATMO)

Source: Institutional Research
Chart Prepared by the Graduate School

<table>
<thead>
<tr>
<th>Masters</th>
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<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<tr>
<td></td>
<td>3.92</td>
<td>3.17</td>
<td>3.80</td>
<td>3.62</td>
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<td>3.43</td>
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</table>

*Source: IR*
New Graduate Student GPA by Level - Fall Data
(GEOG)
Source: Institutional Research
Chart Prepared by the Graduate School

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<td>Masters</td>
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<td>4.00</td>
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*Source: IR*
D. Time to Degree – Average long semesters to graduate for all students graduating each year

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<td>5.75</td>
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<tr>
<td>2010-2011</td>
<td>7.00</td>
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<td>2013-2014</td>
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<td>2014-2015</td>
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*Source: IR*

**Excludes Summer I and Summer II**
Time to Degree - Number of Long Semesters (GEOG)

Source: Institutional Research
Chart Prepared by the Graduate School

<table>
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*Source: IR

**Excludes Summer I and Summer II
Time to Degree - Number of Long Semesters (GEOS)

Source: Institutional Research
Chart Prepared by the Graduate School

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<tr>
<th>Year</th>
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<td>2011-2012</td>
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<td>2013-2014</td>
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*Source: IR*

**Excludes Summer I and Summer II**
E. Provide a breakdown of how many enrolled graduate students are RA’s, TA’s, GA’s or GPTI’s by Academic Year.

<table>
<thead>
<tr>
<th></th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
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</thead>
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<td>Research Assistants</td>
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<tr>
<td>Teaching Assistants</td>
<td>44</td>
<td>46</td>
<td>42</td>
<td>56</td>
<td>64</td>
<td>69</td>
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<tr>
<td>Graduate Assistants</td>
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<td>0</td>
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<td>Graduate Part-time Instructors</td>
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<td>0</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</table>

**RA and TA values are skewed because we don’t know a Cognos report that pulls for incumbents in these positions, only when the positions began and ended per student.**

Source: The Department

F. Number of students who have received national and university fellowships, scholarships and other awards

**Graduate School Scholarships and Fellowships**

Source and Table by the Graduate School

<table>
<thead>
<tr>
<th>AWARD</th>
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<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
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<tbody>
<tr>
<td></td>
<td>$</td>
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<td>#St.</td>
<td>$</td>
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<tr>
<td>AT&amp;T Chancellor’s</td>
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<td>2</td>
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<td>1</td>
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<td>CH Foundation</td>
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<td>8,000</td>
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<td>J.T. and Margaret Talkington</td>
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<td></td>
<td>8,000</td>
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<td>4</td>
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<td>1</td>
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<td>United Supermarkets</td>
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<td>3</td>
<td>3,000</td>
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<td>5,300</td>
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Geosciences
G. Initial position and place of employment of graduates over the past 6 years

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<th>Initial Employer</th>
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<td>Encana</td>
<td>Texas?</td>
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<td>Lubbock, TX</td>
</tr>
<tr>
<td>R01947037</td>
<td>Geology PhD candidate</td>
<td>University of Michigan</td>
<td>Michigan</td>
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<tr>
<td>R00525856</td>
<td>Geology PhD candidate</td>
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<td>Kansas</td>
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<td>Delaware</td>
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<td>R10326304</td>
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<td>Childs Geoscience</td>
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<th>Institution</th>
<th>Location</th>
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<td>Houston, TX</td>
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<td>R10491428</td>
<td>Geophysics</td>
<td>Oil company in Turkey</td>
<td>Turkey</td>
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<td>R10446371</td>
<td>Geochemistry</td>
<td>Edwards Aquifer Authority</td>
<td>Austin, TX</td>
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<tr>
<td>R10474103</td>
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<td>Geologist</td>
<td>QEP Resources</td>
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<td>R01953152</td>
<td>Geologist</td>
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<td>Houston, TX</td>
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</tr>
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<td>Position</td>
<td>Company</td>
<td>City, State</td>
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<td>Plainview, TX</td>
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<tr>
<td>R10455730</td>
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<tr>
<td>R10788167</td>
<td>Atmospheric Science Research Assoc.</td>
<td>University of Oklahoma</td>
<td>Norman, OK</td>
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**2014-2015**

<table>
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<th>ID</th>
<th>Position</th>
<th>Company</th>
<th>City, State</th>
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<td>Paleontology faculty</td>
<td>Istanbul Technical University</td>
<td>Turkey</td>
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<td>CrownQuest</td>
<td>Midland, TX</td>
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<td>Geologist</td>
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<td>Austin, TX</td>
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<td>public school teacher</td>
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<td>R01962537</td>
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<td>Lubbock, TX</td>
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<tr>
<td>R11177733</td>
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<td>Hess Corp</td>
<td>Houston, TX</td>
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<td>R10746493</td>
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<td>R00451708</td>
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<td>R11195284</td>
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<td>University of Oklahoma</td>
<td>Norman, OK</td>
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<tr>
<td>R10825466</td>
<td>Geography PhD program</td>
<td>Texas A&amp;M University</td>
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<tr>
<td>R11166665</td>
<td>job hunting/interviewing</td>
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<td>R10709520</td>
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<tr>
<td>ID</td>
<td>Position</td>
<td>Institution</td>
<td>Location</td>
</tr>
<tr>
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<td>------------</td>
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<tr>
<td>R10451932</td>
<td>Associate Support Engineer</td>
<td>Physical Electronics</td>
<td>Minneapolis, MN</td>
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<td>R11195409</td>
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<td>US Navy Fleet Numerical Meteorology and Oceanography Ctr.</td>
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<td>Rockhill Group</td>
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<td>R11274138</td>
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<td>R11217250</td>
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<td>University of Oklahoma CIMMS</td>
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</tr>
</tbody>
</table>

*Source: The Department*

H. Percentage (%) of full time students receiving financial support.

**ALL**

I. Graduate Student Publications and Creative Activities – Number of discipline-related refereed papers/publications, juried creative/performance accomplishments, book chapters, books, and external presentations by Master and Doctoral students in the department.

<table>
<thead>
<tr>
<th>Publication:</th>
<th>Refereed</th>
<th>Non-Refereed</th>
<th>Poster Presentations</th>
<th>Other activities</th>
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<td></td>
<td>Masters</td>
<td>Doctorate</td>
<td>Masters</td>
<td>Doctoral</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Counting multiple doctoral students in one entry as 1, if masters on the entry as well, counting them as 1.

*Other activities columns include: conference proceedings, oral presentations, newsletters, abstracts, stand-up, other…*
J. Programs for mentoring and professional preparation of graduate students

Students are mentored primarily by their thesis or dissertation advisor, with less formal advising by other members of the faculty. Professional preparation is initially addressed through Graduate Seminar, which introduces students to program expectations, and discusses strategies to promote success. The seminar course also includes a section on ethics in science. Many students who work in research groups supported by federal funding are also required to participate in the TTU Responsible Conduct of Research program, which requires students to participate in a minimum of 3 seminars each semester addressing the broad topic of ethics in science.

All students who are considered University employees must take annual training in safety awareness, and those who work in laboratories participate in the University laboratory safety program, which is designed to engender a personal responsibility for the safety of oneself and others working in laboratory environments. Ideally, students will carry forwards the training into their professional careers.

Professional preparation is not formally worked into the curriculum, but there are several department activities that contribute to the general ethos, including, a seminar course preparing a team the AAPG Imperial Barrel award, the AMS Student Chapter works with the National Weather Service to organize a Severe Weather Awareness program and participating in a program monitoring forecasting models, many students preparing for employment in the oil and gas industry enroll in Advanced Petrophysics which is a case-study, applied science course working on real-world datasets, while students with interests in analytical sciences participate in courses with significant hands-on practical activities with an emphasis on practical application of analytical instrumentation and data management.

The Department, sometimes in conjunction with student societies in sub-groups, regularly bring visiting speakers to campus and opportunities are always provided for students to engage with the visitor, and where appropriate, the Geoscience Leadership Organization for Women (GLOW) host a lunch for a less formal round-table with visitors.

K. Department efforts to retain students and graduation rates.

Students are responsible for familiarizing themselves with the benchmarks for progress in the graduate program (using information published in the Graduate Handbook), and advisors are responsible for counseling the students in their progress. Graduate Advisors review the progress of individual students on an annual basis, and where appropriate, consult with the Graduate Committee and individual student advisors to recommend remedies for students who are not progressing appropriately, or who are struggling academically.
Support for students to promote timely graduation is mainly provided through financial and scholarship aid during the summer sessions, which enables students to remain focused on their research, rather than seek secondary employment.

L. Percentage of Full-Time and Part Time students per year by level – Fall Data

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<thead>
<tr>
<th>Masters</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Time</td>
<td>73.81%</td>
<td>71.43%</td>
<td>66.15%</td>
<td>68.75%</td>
<td>71.67%</td>
<td>86.44%</td>
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<tr>
<td>Part Time</td>
<td>26.19%</td>
<td>28.57%</td>
<td>33.85%</td>
<td>31.25%</td>
<td>28.33%</td>
<td>13.56%</td>
</tr>
<tr>
<td>Doctoral</td>
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<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>Full Time</td>
<td>71.43%</td>
<td>58.33%</td>
<td>78.57%</td>
<td>76.92%</td>
<td>88.24%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Part Time</td>
<td>28.57%</td>
<td>41.67%</td>
<td>21.43%</td>
<td>23.08%</td>
<td>11.76%</td>
<td>0.00%</td>
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</table>

Geosciences
V. Department

A. Department operating expenses

<table>
<thead>
<tr>
<th>Year</th>
<th>Dept Operating Cost</th>
<th>Faculty &amp; Staff</th>
<th>Dept Op Cost/FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/10</td>
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<td>30</td>
<td>$7475.45</td>
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<tr>
<td>10/11</td>
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<td>11/12</td>
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<td>12/13</td>
<td>$287,799</td>
<td>30.75</td>
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<tr>
<td>13/14</td>
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<tr>
<td>14/15</td>
<td>$294,201</td>
<td>36.24</td>
<td>$8118.13</td>
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</table>

**Dept Operating Cost**

*Source: AFISM
Org. #: B53009

*Faculty & Staff*

Source: The Department

**Dept Op Cost/FS**

*Source: AFISM
Org. #: B53009
B. Summary of Proposals (submitted)

### Summary of Number of Proposals Written

*Source: The Department*

<table>
<thead>
<tr>
<th>Years</th>
<th>Federal</th>
<th>Federal Pass-</th>
<th>Foreign</th>
<th>Industrial</th>
<th>Nonprofit</th>
<th>Other</th>
<th>State</th>
<th>University</th>
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<td>D</td>
<td>M</td>
<td>D</td>
<td>M</td>
<td>D</td>
<td>M</td>
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<td>6.00</td>
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</table>

*The number of proposals are calculated by summing up the percentage contribution of the faculty on the given proposal.*

\[\text{D} = \text{Disciplinary (Internal)} \quad \text{M} = \text{Multidisciplinary (External)}\]

### Summary of Number of Proposals Accepted

*Source: The Department*

<table>
<thead>
<tr>
<th>Years</th>
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<th>Federal Pass-</th>
<th>Foreign</th>
<th>Industrial</th>
<th>Nonprofit</th>
<th>Other</th>
<th>State</th>
<th>University</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>D</td>
<td>M</td>
<td>D</td>
<td>M</td>
<td>D</td>
<td>M</td>
<td>D</td>
<td>M</td>
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<tr>
<td>2011</td>
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<td>3.00</td>
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<tr>
<td>2010</td>
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</tbody>
</table>

*The number of proposals are calculated by summing up the percentage contribution of the faculty on the given proposal.*

\[\text{D} = \text{Disciplinary (Internal)} \quad \text{M} = \text{Multidisciplinary (External)}\]

C. External Research

### Summary of Faculty Awards by Home Department

*Source: The Department*

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Awards</th>
<th>Facilities &amp; Administrative</th>
<th>Award Amount</th>
</tr>
</thead>
<tbody>
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<tr>
<td>2010</td>
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<td>$2,008,375.00</td>
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<tr>
<td>2011</td>
<td>27.6</td>
<td>$251,887.00</td>
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<td>2012</td>
<td>25.83</td>
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Comparison of Research Expenditures

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<th>University</th>
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<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Arkansas</td>
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<td>$9,500,000</td>
<td>$10,160,000</td>
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<td>University of Nebraska</td>
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<td>Kansas State University - Geology</td>
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<td>Texas Tech University</td>
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<td>$7,791,231</td>
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<td>$891,396</td>
<td>$25,285,690</td>
<td>$659,546</td>
</tr>
</tbody>
</table>

*Source: The Department*

**Based on calendar year

***Department does not understand the TTU value given for 13/14 by the Grad School***
### D. Internal Funding

#### Source of Internal Funds (TTU)

<table>
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<th></th>
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<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
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<td>New Faculty Start-ups</td>
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<td>23000</td>
<td>53791</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAF (as part of start-up)</td>
<td>323596</td>
<td>438000</td>
<td>275346</td>
<td>35080</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS:</strong></td>
<td>626066</td>
<td>706257</td>
<td>563246</td>
<td>381694</td>
<td>407371</td>
<td>0</td>
</tr>
</tbody>
</table>

### E. Scholarships and Endowments

#### Endowment Amount ($)

<table>
<thead>
<tr>
<th>Name of Endowment</th>
<th>9/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
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</thead>
<tbody>
<tr>
<td>George B. Asquith</td>
<td>$11,535.96</td>
<td>$12,122.52</td>
<td>$13,772.83</td>
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<tr>
<td>John P. Brand</td>
<td>$36,481.64</td>
<td>$38,336.61</td>
<td>$41,742.24</td>
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</tr>
<tr>
<td>Gary Elbow</td>
<td>$26,613.99</td>
<td>$38,276.39</td>
<td>$51,833.87</td>
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<td></td>
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<tr>
<td>Alonzo D. Jacka</td>
<td>$42,306.50</td>
<td>$44,457.64</td>
<td>$51,483.03</td>
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<td></td>
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<tr>
<td>Jurica Atmospheric Sciences</td>
<td>$66,798.59</td>
<td>$71,192.86</td>
<td>$78,282.29</td>
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</tr>
<tr>
<td>E.A. McCullough Grad Research</td>
<td>$72,381.48</td>
<td>$76,061.85</td>
<td>$82,818.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portnoy Liquidus</td>
<td>$29,640.97</td>
<td>$31,453.87</td>
<td>$36,409.37</td>
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<tr>
<td>Deskin Shurbet</td>
<td>$42,651.21</td>
<td>$45,026.07</td>
<td>$50,029.34</td>
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<tr>
<td>Dr. F. Alton Wade Research</td>
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<td>$0.00</td>
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</table>

*Only endowments for graduate student support are listed here, not chair, undergraduate or operating endowments*

*Values listed are market value at the beginning of FY*
F. Departmental resources for research and teaching (i.e., classroom space, lab facilities)

Source: Planning and Administration
Table Prepared by the Graduate School

<table>
<thead>
<tr>
<th>Type of Space:</th>
<th>Number of Rooms</th>
<th>Total Assignable Square Feet:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices:</td>
<td>99</td>
<td>19,250</td>
</tr>
<tr>
<td>Labs:</td>
<td>30</td>
<td>10,499</td>
</tr>
<tr>
<td>Storage:</td>
<td></td>
<td></td>
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<tr>
<td>Teaching:</td>
<td>24</td>
<td>13,349</td>
</tr>
<tr>
<td>Library:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SQUARE FEET:</strong></td>
<td><strong>153</strong></td>
<td><strong>43,098</strong></td>
</tr>
</tbody>
</table>

G. HEAF expenditures

**NON START-UP HEAF**

<table>
<thead>
<tr>
<th></th>
<th>Labs</th>
<th>Classroom</th>
<th>Other (Identify)</th>
<th>TOTAL</th>
</tr>
</thead>
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<td>FY 2015</td>
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<tr>
<td>FY 2013</td>
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<td></td>
<td></td>
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<tr>
<td>FY 2012</td>
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<td>$190,840</td>
</tr>
<tr>
<td>FY 2010</td>
<td></td>
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</tr>
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</table>

H. External Program Accreditation – Name of body and date of last program accreditation review, if applicable. Include description of body and accreditation specifics.

None
I. Describe any Centers or Institutes within the unit and how they contribute to or benefit the graduate programs?

**Geology and Geophysics**

**Aqueous Geochemistry Laboratory.** The Aqueous Geochemistry Laboratory is fully equipped for low-temperature experimental studies. The laboratory contains a range of commercial instrumentation and custom designed equipment. [http://www.geosciences.ttu.edu/facilities/geo_aqgeochem.php](http://www.geosciences.ttu.edu/facilities/geo_aqgeochem.php)

**Microscopy.** The Department houses a number of optical microscopes configured with digital cameras with various image analysis software packages (e.g., Photoshop, NIH Image, StripStar, etc.). These scopes and cameras are regularly utilized for research and teaching by students and faculty in structural geology, igneous, metamorphic, and sedimentary petrology, paleo, as well as civil and petroleum engineering. This lab and equipment is in addition to our teaching laboratory which contains a full suite of Nikon optical microscopes. [http://www.geosciences.ttu.edu/facilities/geo_microscopy.php](http://www.geosciences.ttu.edu/facilities/geo_microscopy.php)

**College of Arts & Sciences Microscopy Laboratory.** This lab includes several optical and electron microscopes (SEM and STEM). [http://www.depts.ttu.edu/uic/index.php](http://www.depts.ttu.edu/uic/index.php)

**GeoAnalytical Laboratory.** The GeoAnalytical Laboratory is a research oriented facility. We work with undergraduates, graduate students, and professors to determine the chemical composition of their research samples. The Lab houses a Leeman Labs inductive coupled plasma – atomic emission spectrometer (ICP-AES) and Perkin-Elmer atomic absorption spectrometer (AA). [http://www.geosciences.ttu.edu/facilities/geo_geoanalytical.php](http://www.geosciences.ttu.edu/facilities/geo_geoanalytical.php)

**Laboratory for Stable Isotope Geochemistry.** Stable Isotope Laboratory at Texas Tech University is equipped with a Delta V mass spectrometer with peripherals (GasBench, EA, TC-EA, Trace GC and GC IsoLink) for isotopic analysis of water, biomass, hydrocarbons, minerals and other materials. [http://www.geosciences.ttu.edu/facilities/geo_isotope.php](http://www.geosciences.ttu.edu/facilities/geo_isotope.php)

**Magnetic Sector ICPMS Laboratory for Isotope Geochemistry and Geochronology.** The laboratory is designed for high-precision isotope measurements in aspirated solutions, particularly using an ARIDUS II desolvation nebulizer, and by laser ablation. There are two magnetic sector ICPMS instruments: a Nu Plasma II-ES (enhanced sensitivity) multi-collector with a 16-channel Faraday collector array and six full size discrete dynode multipliers; and a Nu AttoM-ES single collector equipped with a single low noise, discrete dynode ETP electron multiplier. The laser is a NWR193UC deep UV (193nm) ablation system that includes a 100mm x 100mm, two-volume ablation chamber (TV2) with non-cantilevered mounting, providing rapid washout (<0.5s) and good spot-to-spot reproducibility (± 1%RSD). The two ICPMS instruments may be coupled jointly to the laser for “split stream” analyses. An adjoining chemistry lab provides facilities for preparing purified solutions for introduction to the ICPMS instruments.
**Geology Computer Lab.** 20 PCs available for teaching and student research.

**Geography**

**Geographic Information Systems Lab.** A computer lab equipped with 16 networked workstations and state-of-the-art software for the analysis of spatial data.  
http://www.geosciences.ttu.edu/facilities/geog_gis_lab.php

**Remote Sensing Lab.** A computer lab equipped with 18 networked workstations and state-of-the-art software for remote sensing analysis.  
http://www.geosciences.ttu.edu/facilities/geog_rs_lab.php

**Arts and Sciences Center for Geospatial Technology.** The mission of the Center for Geospatial Technology is to promote, facilitate and support the application of geospatial technologies in interdisciplinary research, education, and community service.  
http://gis.ttu.edu/center/

**Physical Geography Research Lab.** A laboratory equipped with GPS receivers, field instrumentation, and equipment for basic surveying and sediment analysis.

**Physical Geography Teaching Lab.** A teaching lab equipped with 15 workstations for use in undergraduate courses.  
http://www.geosciences.ttu.edu/facilities/geog_phys_teaching_lab.php

**Atmospheric Science**

**Ka-band Radar Trucks.** Two Ka-band mobile high-frequency Doppler radars to analyze the fine-scale structure of atmospheric phenomena. (National Wind Institute property).  
http://www.depts.ttu.edu/nwi/facilities/ka-band-radar.php

**StickNet.** A large array of portable, rapidly-deployable atmospheric measurement stations.  
http://www.depts.ttu.edu/ttuhrt/Instrumentation/StickNet.php

**West Texas Lightning Mapping Array.** A real-time network of VHF sensors providing total lightning mapping across West Texas, supporting research as well as local and national operational testbed operations.  
http://pogo.tosm.ttu.edu/about/

**West Texas Mesonet.** Over 90 instrumented sites across West Texas and Eastern New Mexico, providing measurements of the atmosphere and soil properties at an average inter-station spacing of 50 km. In addition, there are 7 boundary layer SODAR units.  
http://www.mesonet.ttu.edu/

**VorTECH.** A 10 m diameter chamber used to simulate the velocity and pressure profiles of scaled tornado-like vortices

**200 Meter Tower.** An instrumented tower sampling meteorological variables (30 Hz) at ten levels.  
http://www.depts.ttu.edu/nwi/facilities/200-m-tower.php

**Measurement and Analysis Laboratory.** An NSF-sponsored lab dedicated to topics in instrumentation and signal processing.  
http://www.geosciences.ttu.edu/facilities/atmo_ma_lab.php
Research Instrumentation Laboratory. Lab space for ongoing research projects requiring a clean development and diagnostic environment. [http://www.geosciences.ttu.edu/facilities/atmo_inst_lab.php](http://www.geosciences.ttu.edu/facilities/atmo_inst_lab.php)


Boundary Layer Wind Profiler. A 900 MHz lower-troposphere wind profiler providing routine data at 20 minute intervals. [http://www.mesonet.ttu.edu/ReeseProfiler.html](http://www.mesonet.ttu.edu/ReeseProfiler.html)

Vaisala Sounding System. A radiosonde platform used to support operations and research. [http://www.geosciences.ttu.edu/facilities/atmo_vaisala.php](http://www.geosciences.ttu.edu/facilities/atmo_vaisala.php)
VI. Conclusion

The Graduate Programs in Geosciences, in general, are healthy. Overwhelmingly, the students have done good work in the programs and have been successful getting jobs or pursuing more advanced degrees. The MS programs in Geosciences and Atmospheric Sciences are doing well in educating students and preparing them for careers in their respective disciplines. The PhD, too, is doing a good job but the number of students graduating the program is low. The Geography MS still is new and, while the students are doing well, there is much room for improvement.

While the Atmospheric Sciences and Geosciences MS programs are successful, there is room for improvement in the number of students. As many of the faculty are already near the maximum number of graduate students for quality mentoring, not to mention high undergraduate teaching responsibilities in Geology and Geophysics, this would be solved by the addition of new faculty lines. Higher TA and RA salaries would increase the number of high quality applicants. Space for graduate student offices, especially for Geology and Geophysics students, is a concern.

The low number of graduates of the PhD program, we feel, is a temporary issue and the number will increase soon. If a large increase of PhD students is desired, that too will require more faculty and higher salaries.

The MS in Geography primarily is struggling due to low faculty numbers and the fact that, since starting in 2012, it has not yet established a reputation to attract high quality students from other universities. More faculty are sorely needed to bring the program up to proper standards. Higher TA/RA salaries also will benefit the program.

For all areas of the Department, stronger IT support will help graduate students complete their research in a faster manner as well as adding to their education in computational methods.

Facilities is a major issue for the Graduate Programs in the Department. More office space and more lab space are needed to increase numbers of students and the quality of their education. Equally important is the quality of the space in the sixty-five year old Science Building, where water, electricity, HVAC, windows and walls all need updating.
VII. Appendices – should include, but not be limited to, the following:

Table of Contents

a. Strategic plan
   - Attachment from Strategic Planning website
b. Curriculum Map (table)
c. 18 Characteristics
d. Graduate Course Offerings (table)
e. Graduate Student Handbook
f. Graduate Student Association(s) – Description and Information
g. Graduate Faculty 6-Year Resumes (obtained from digital measures)
h. GRE Revised General Test Scores
i. Unit Assessment Report from TRACDAT
j. Courses cross listed (TANDEM)
APPENDIX A

Strategic Plan
MISSION STATEMENT

The Department of Geosciences emphasizes research and education in the Solid-Earth and Atmospheric Sciences and Geography, through an understanding of the physical processes that govern the state and evolution of the earth-atmosphere system, the recognition of the impact these systems have on society, and the interactions between humans and the natural world. Students graduating from our degree programs will have the knowledge and skills to be strongly competitive for jobs in private, academic and government positions within their respective disciplines. In addition, we provide high-level integrated science literacy to students from other disciplines, so that they may become informed decision makers of the future.

VISION STATEMENT

The Department of Geosciences aspires to the highest standards of excellence in all aspects of teaching, research, and service. It recognizes that the subdisciplines of the Geosciences serve as the basis for any fundamental understanding of environmental processes, natural resources, and natural hazards. These subdisciplines include Geology, Geophysics, Atmospheric Science and Geography. As such, the Department strives to maintain a faculty that is recognized nationally and internationally for their research and teaching contributions and to maintain our existing and emerging programmatic strengths. Our goal is to build a foundation for healthy, long-term scientific enterprise that focuses on transformational shifts in understanding, conveyed to students in classroom and research settings.

To this end, our vision is three-fold for the next decade. First, we are dedicated to maintaining our current programmatic strengths. Second, we look to address emerging long-term regional and national needs for water and energy resources analysis and management. Third, we wish to increase our research and teaching emphasis in the interdisciplinary realms of climate science and unconventional energy resources.
PRIORITY 1: INCREASE ENROLLMENT AND PROMOTE STUDENT SUCCESS

Objective 1.1: Increase graduate and undergraduate quality, diversity, and numbers.

Strategies

General:
- Recruit graduate and undergraduate students internally, regionally, nationally, and internationally.
- Place graduate recruiting emphasis in strategic research areas within Atmospheric Sciences, Solid Earth Geosciences, and Geography.
- Continue existing recruitment efforts at the conferences of the American Geophysical Union, the Geological Society of America, the American Meteorological Society, the American Association of Petroleum Geologists, the Association of American Geographers.
- Continue honors courses in Geography and Atmospheric Science, and develop additional honors courses in Geology.
- Pursue the development of an undergraduate B.S. in Atmospheric Sciences.
- Pursue the improvement of graduate RA and TA stipends.

Local & Regional Recruiting:
- Participation in local science fairs.
- Offer faculty lecture presentations to local and regional colleges.
- Invite local high school students to Department of Geosciences Research Day.
- Promote department at local K-12 school events (Career and Technical Educational Showcase events).
- Develop and supervise summer research projects for high school students and science teachers.

National & International Recruiting:
- Utilize Graduate Enrollment Enhancement Program (GEEP) funds to attract the high-quality graduate student applicants.
- Maintain existing student exchange programs with international universities.
- Utilize existing and new national and international collaborations to promote Departmental expertise to potential graduate students.

Assessments:

- Track student applications and admittance numbers resulting from recruitment activities.
- Track retention rates.

Objective 1.2: Promote Student Success.

Strategies:

- Evaluate and, where appropriate, revise the graduate Geosciences curriculum to improve the quality, duration, and rigor of graduate education.
- Revise and implement Department policy for graduate student admissions and evaluation at both MS and Ph.D. levels.
- Evaluate and, where appropriate, revise the undergraduate Geosciences curriculum to promote greater use of higher mathematics, chemistry, physics, biology, and computers.
- Consider development of an "earth-system science" emphasis in the Geosciences B.A. degree.
- Continue to monitor student curricula, with emphasis on students completing course work in sequence.
- Pursue the development and growth of an undergraduate program in Geographic Information Science and Technology (GIST).
- Develop a graduate certificate program in GIST.
- Present departmental awards for excellence in undergraduate and graduate research.
- Increase participation in Center for Undergraduate Research Activities.
- Maintain the annual Department of Geosciences Research Day.
- Encourage student membership and participation in professional societies.
- Continue faculty participation in Tech Transitions (formerly Freshman Seminar).
- Provide research training in all geography upper-level courses.
- Require each undergraduate senior in Geography to present a research project, based on the capstone course, at either the Center for Undergraduate Research Conference or the Department of Geosciences Research Day.
- Increase undergraduate student involvement in funded research endeavors.

Assessments:

- Track number and types of degrees awarded (as part of program review).
- Track general enrollment, retention, and graduation numbers through matriculation.
- Track the number of majors as determined by enrollments in GEOL 2303.
- Undergraduate committee and advisors monitor GPA of incoming majors.
- Evaluate student projects on the basis of the extent to which they demonstrate research techniques.

Key Performance Indicator for Priority 1: Increase number enrolled in graduate programs by 2 per program per year for next three years.

**PRIORITY 2: STRENGTHEN ACADEMIC QUALITY AND REPUTATION**

**Objective 2.1:** Attract and retain faculty, staff and professionals and increase job satisfaction for all employees.

**Strategies:**

- Pursue the development and funding of endowed Chairs in the Department of Geosciences.
- Advertise staff openings in local and regional minority media.
- Encourage staff to participate in Staff Senate and other appropriate groups.
- Facilitate spousal/partner accommodation when possible and appropriate.
- Strengthen mentoring programs for faculty, staff, and professionals.
- Network with graduate programs to identify quality Ph.D. graduates/postdoctoral students eligible to fill new faculty lines.
- Identify peer institutions and advocate for pay and resources that meet or exceed those offered by our peers.
• Pursue the development of a Departmental Faculty & Staff Handbook.

Assessments:

• Number of applications for faculty positions.
• Number of new dedicated faculty lines.
• Diversity of applicant pools using EEO and Personnel office data.
• Diversity of hired faculty, academic professionals, and staff.
• Frequency/amount of merit raises for faculty, staff and professionals.

**Objective 2.2: Promote and recognize productive faculty.**

**Strategies:**

• Pursue the development and funding of endowed Chairs in Geosciences.
• Maintenance of fair, constructive and rigorous review processes, such as in annual reviews, tenure and promotion reviews and post-tenure reviews.
• Nominate faculty for University and National awards for scientific/teaching achievement.

**Assessments:**

• Number of faculty in department receiving internal recognition awards.
• Number of faculty in department receiving external recognition awards.
• Number of faculty in department receiving nationally-recognized awards.

**Objective 2.3: Enhance teaching and learning excellence.**

**Strategies:**

• Maximize and simplify instructor access to technology within the classroom.
• Integrate results of research in pedagogy into the curriculum.
• Consider development of an “earth-system science” emphasis in the Geosciences B.A. degree.
• Nominate exemplary faculty for teaching awards.
• Utilize teaching development tools and workshops provided by the TTU Teaching Learning and Professional Development (TLPD) Center.
• Utilize cross-disciplinary courses to better integrate geography, solid Earth, and atmospheric sciences through expanding 3-dimensionional visualization capabilities, digital map facilities, and increasing usage of Geographic Information Science and Technology (GIST), remote sensing and satellite and airborne imagery in teaching and research.
• Hire 2 part-time instructors in Geographic Information Science and Technology (GIST).
• Pursue the development and implementation of an exit evaluation for graduate and undergraduate students.

**Assessments:**

• Attendance at TLPD workshops.
• Number of faculty in department receiving internal recognition awards.
• Number of faculty in department receiving external recognition awards.
• Number of faculty in department receiving nationally-recognized awards.
- Number of faculty engaged in undergraduate research supervision.
- Numbers of cross-disciplinary students.
- Numbers of cross-disciplinary students continuing to graduate school.
- Number of abstract submissions to annual Geosciences Research Day volume.

Objective 2.4: Increase the national recognition of our programs.

Strategies:

- Pursue the development and funding of endowed Chairs in Geosciences.
- Prioritize the placement of graduates within desirable positions related to their major and/or minor in post-baccalaureate and post-graduate positions.
- Increase student-coauthored publication in peer-reviewed national and international journals.
- Maintain existing and foster new research collaboration with other universities.
- Increase faculty attendance at national conferences to disseminate research.
- Volunteer for leadership roles in national conference planning and administration (e.g., professional conference convener, conference/session chairs, etc.).
- Volunteer for service roles related to the mission of professional organizations (e.g., policy development, editorships, etc.).
- Increase external contracts for analytical facilities.

Assessments:

- Track post-baccalaureate and post-graduate student placement.
- Number of new out-of-state graduate students.
- Number of collaborative inter-university proposals submitted/funded.
- Number of national service positions held by faculty (editorships, Society counsel positions, etc.).
- Peer-reviewed publications and conference proceedings in national and international journals.
- Number of faculty in conference/society administrative roles.
- Number of external contracts and resulting publications.

Key Performance Indicator for Priority 2: Increase number of peer reviewed publications by 10% in at the end of three years.

PRIORITY 3: EXPAND AND ENHANCE RESEARCH

Objective 3.1: Enhance multidisciplinary research.

Strategies:

- Seek new faculty appointments in the broad, interdisciplinary fields of atmospheric sciences, energy and water resources. These may include appointments in: (a) Earth materials, fluid flow, geomechanics and/or related fields pertaining to fundamental understanding of earth materials in the development of unconventional energy resources. (b) Geographic Information Science and Technology. (c) Observational and computational atmospheric fluid dynamics to support a newly developed B.S. degree program in Atmospheric Science. (d) Numerical climate modeling studies and/or paleo-climate analysis of the geologic record. (e) Stable and radiogenic
heavy isotope geochemistry and their application to understanding processes in Geosciences. 
(f) Hydrogeology and related fields pertaining to physical, chemical and mathematical 
understanding of groundwater evolution, with special emphasis on the Southern High Plains. 
(g) Human-environment interaction modeling.

- Pursue the development and funding of three endowed chairs across Atmospheric Sciences, Solid 
Earth geosciences, and Geography.

Assessments:

- Number of faculty hires.

Objective 3.2: Maintain and enhance current collaborations with other TTU units.

Strategies:

- Continue Department of Geosciences collaborations with the following TTU units: Wind Science 
  and Engineering Research Center, TIEHH and biohazards program, Water Resources Center, 
  Center for Applied Petrophysical Studies, the Museum of Texas Tech University, the College 
  of Education, and the TTU High Performance Computing Center, as well as various TTU 
  Departments.
- Explore collaborative opportunities with new Climate Science Center.

Assessments:

- Numbers of collaborative peer-reviewed papers submitted/published.
- Number of collaborative proposals submitted/funded.

Objective 3.3: Maintain existing and develop new collaborations with units external to TTU.

Strategies:

- Maintain facilities that encourage visiting faculty, scholars, and researchers.
- Maintain and expand collaboration with the petroleum industry.
- Continue collaboration with government agencies including N.I.S.T., National Laboratories 
  (National Severe Storms Laboratory, National Center for Atmospheric Research, National 
  Hurricane Center, Oak Ridge National Laboratory), and the USDA Agricultural Research 
  Service.
- Continue collaboration with domestic universities including the University of Wyoming, UT-El 
  Paso, Texas A&M, Woods Hole Oceanographic Institute, UT-Austin, University of Oklahoma, 
  University of California at Santa Barbara, the Pennsylvania State University, University of 
  Illinois, and others.
- Continue collaboration with international universities and agencies including the University of 
  Montpellier (France), University of Lausanne (Switzerland), Norwegian University of Science 
  and Technology, Norwegian Geological Survey, Indian Statistical Institute (Calcutta), Institute 
  of Vertebrate Paleontology and Paleoanthropology (Beijing), National Museum of Natural 
  History (Buenos Aires), University of St. Andrews (Scotland), and others.
- Continue collaboration with regional analytical consortium with NMSU, NM Tech.

Assessments:
• Numbers of collaborative peer-reviewed papers submitted/published.
• Number of collaborative proposals submitted/funded.

**Objective 3.4: Increase the available analytical and experimental facilities for teaching and research.**

**Strategies:**

• Improve funding for laboratories and facilities that is comparable to other equivalent research universities.
• Pursue the development and implementation of a plan for routine maintenance and upgrades of existing equipment and facilities.
• Improve funding and resources for laboratory and analytical support staff and involve staff in collaborative research endeavors.

**Assessments:**

• Number of equipment users.
• Numbers of collaborative peer-reviewed papers citing lab data submitted/published.
• Number of collaborative proposals citing lab data submitted/funded.
• Number of contracts per year.

**Objective 3.5: Pursue opportunities that would facilitate all sub-units of the Department of Geosciences to be housed together.**

**Strategies:**

• Continue to engage in discussion with University administration regarding housing of department.
• Identify possible major donors for such construction and engage in fund-raising and marketing for construction.

Necessary facilities of a new building would include:

- State-of-the-art geochemistry laboratory facilities for experimental aqueous geochemistry, stable isotopic geochemistry, LA-ICP-MS and IA-ICP analysis.
- Information Technology laboratories for research and teaching of GIST, remote sensing, 3-dimensional visualization.
- Core laboratory facilities and storage.
- Field equipment storage facilities, both for the atmospheric sciences and geology.
- West Texas Mesonet offices.
- Office, technology (including high-reliability communication and power infrastructure) and laboratory space to allow for integration with the National Weather Service and local USGS offices.
- Sufficient faculty and staff office and research space.
- Visiting researcher offices.
- Graduate student offices.
- Conference space.
Assessments:

- Note level of interaction and any commitment from University administration.
- Number of fund-raising events and donors and amounts.

Key Performance Indicator for Priority 3: Continue to increase funded research as measured by 3-year running average.

**PRIORITY 4: FURTHER OUTREACH AND ENGAGEMENT**

**Objective 4.1: Curricular Engagement.** Provide teaching, learning, and scholarly activities that engage faculty, students and community in mutually beneficial collaboration, addresses community needs, deepen student’s civic learning, enhance well-being of community, and enrich scholarship of institution.

**Strategies:**

- Promote applied and service-learning projects
- Further develop and promote GIST education, petroleum geology education, hydrogeology education, and atmospheric science education.
- Provide education in personal and social responsibility (Social and Behavioral Core curriculum courses: Human Geography and World Regional Geography).

**Assessments:**

- Number of internal participants (e.g., students, faculty, staff).
- Number of external participants.

**Objective 4.2: Outreach and Partnerships.** Provide institutional resources for community uses; Pursue scholarly collaborations that constitute beneficial exchange, exploration, discovery, and application of knowledge, information and resources.

**Strategies:**

- Promote course- and research-related science exhibitions at the TTU museum.
- Promote science education in the local and national community through participation in science fairs, National Science Day activities, Earth Week activities, Science: It’s a Girl Thing, Saturdays, Mother-Daughter Science Day, science teacher training, Storms Awareness Week.
- Sponsor local panel discussions on various Geoscience-related topics.

**Assessments:**

- Compile geographic area served information from OEMI.
- Compile area of concern and form information from OEMI (including all activities that benefit the community in water resources, land use / land cover change, planning, weather/climate/climate change forecasting, alternative resources, and traditional oil and gas).
- Compile collaborative relationships information from OEMI (with the petroleum industry,
national and state agencies, regional analytical consortium, domestic universities, and international universities and agencies).

**Key Performance Indicator for Priority 4: Increase in the number of engagement events and the proportion of faculty and students involved in engagement.**

### PRIORITY 5: INCREASE AND MAXIMIZE RESOURCES

**Objective 5.1: Improve Alumni relations and support**

**Strategies:**

- Develop and implement a plan for outreach and fund-raising to alumni and friends of the department. Coordinate with Office of Development.
- Continue to increase emphasis on interacting with alumni at professional meetings, particularly AAPG, SEG, GSA, AUS, AMS, AAG, and AGU.
- Develop talking points to guide faculty when discussing fund-raising with alumni and friends.
- Involve appropriate senior faculty, emeritus faculty, alumni, etc. (e.g., Don Haragan, George Asquith, etc.).
- Expand webpage for alumni to post news and other information.
- Utilize social media to increase Department outreach.
- Continue publication of the Geoscience newsletter. Distribute news about accomplishments and events to alumni and friends.
- Coordinate news of alumni accomplishments with the Ex-Students Association.
- Initiate a fundraising campaign with specific financial and capital goals.

**Assessments:**

- Amount of donations from alumni, industry.

**Objective 5.2: Improve departmental governance and committee structure.**

**Strategies:**

- Revise and implement model for Geosciences governance.
- Codify committee mandates.
- Evaluate and revise staff job descriptions.

**Assessments:**

- Variety and number of faculty in various Departmental administrative positions.

**Key Performance Indicator for Priority 5: Increase donations to department by 10% at the end of three years.**
APPENDIX B

Curriculum Map
<table>
<thead>
<tr>
<th>Courses in Degree Program</th>
<th>[i] Outcome Statement (X, M)</th>
<th>[ii] Level (I, R, A)</th>
<th>[iii] Feedback (F)</th>
<th>[i] Outcome Statement (X, M)</th>
<th>[ii] Level (I, R, A)</th>
<th>[iii] Feedback (F)</th>
<th>[i] Outcome Statement (X, M)</th>
<th>[ii] Level (I, R, A)</th>
<th>[iii] Feedback (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized Courses</td>
<td>M</td>
<td>I</td>
<td>F</td>
<td>M</td>
<td>I, R</td>
<td>F</td>
<td>M</td>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>GEOL/GPH 7000</td>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
<td>F</td>
</tr>
</tbody>
</table>

Legend:

[i] OUTCOME STATEMENT:
The program outcome is (x) EXPLICITLY (score of 2) or (m) IMPLICITLY (score of 1) reflected in the course syllabus as being one of the learning outcomes for this course.

[ii] LEVEL OF CONTENT DELIVERY:

(i) INTRODUCED - Students are not expected to be familiar with the content or skill at the collegiate level. Instruction and learning activities focus on basic knowledge, skills, and/or competencies and entry-level complexity. Only one (or a few) aspect of a complex program outcome is addressed in the given course (score of 1).

(ii) REINFORCED - Students are expected to possess a basic level of knowledge and familiarity with the content or skills at the collegiate level. Instruction and learning activities concentrate on enhancing and strengthening knowledge, skills, and expanding complexity. Several aspects of the outcome are addressed in the given course, but these aspects are treated separately (score of 2).

(iii) ADVANCED - Students are expected to possess a strong foundation in the knowledge, skill, or competency at the collegiate level. Instructional and learning activities continue to build upon previous competencies with increased complexity. All components of the outcome are addressed in the integrative contexts (score of 3).

[iii] FEEDBACK ON STUDENT PERFORMANCE / ASSESSMENT:

(F) Students are asked to demonstrate their learning on the outcome through homework, projects, tests, etc. and are provided formal feedback (score of 1).

Selected Program Learning Outcomes:

- Upon graduation student will have conducted an original piece of significant research.
- Upon graduation, students can communicate effectively.
- Upon graduation, students have demonstrated a thorough fundamental knowledge of topics in Geography.

Based on curriculum map from Norfolk State University. Distributed with permission by Alexei G. Malveev (agmalveev@nsu.edu)
Texas Tech University Program Level - Curriculum Map

**LEGEND**

1. **OUTCOME STATEMENT:**
   The program outcome is either explicitly (score of 2) or implicitly (score of 1) reflected in the course syllabus as being one of the learning outcomes for this course.

2. **LEVEL OF CONTENT DELIVERY:**
   - (I) INTRODUCED - Students are not expected to be familiar with the content or skill at the collegiate level. Instruction and learning activities focus on basic knowledge, skills, and/or competencies and entry-level complexity. Only one (or a few) aspect of a complex program outcome is addressed in the given course (score of 1).
   - (R) REINFORCED - Students are expected to possess a basic level of knowledge and familiarity with the content or skills at the collegiate level. Instruction and learning activities concentrate on enhancing and strengthening knowledge, skills, and expanding complexity. Several aspects of the outcome are addressed in the given course, but these aspects are treated separately (score of 2).
   - (A) ADVANCED - Students are expected to possess a strong foundation in the knowledge, skill, or competency at the collegiate level. Instructional and learning activities continue to build upon previous competencies with increased complexity. All components of the outcome are addressed in the integrative contexts (score of 3).

3. **FEEDBACK ON STUDENT PERFORMANCE / ASSESSMENT:**
   (F) Students are asked to demonstrate their learning on the outcome through homework, projects, tests, etc. and are provided formal Feedback (score of 1).

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEOL/GPH 6000</td>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
</tr>
</tbody>
</table>

**SELECTED PROGRAM LEARNING OUTCOMES**

- Upon graduation student will have conducted an original piece of significant research.
- Upon graduation, students can communicate effectively.
- Upon graduation, students have demonstrated a thorough fundamental knowledge of topics in Geography.
# Texas Tech University Program Level - Curriculum Map

**Legend**

<table>
<thead>
<tr>
<th>Outcome Statement:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x) Explicitly (score of 2) or</td>
</tr>
<tr>
<td>(m) Implicitly (score of 1)</td>
</tr>
<tr>
<td>reflected in the course syllabus as</td>
</tr>
<tr>
<td>being one of the learning outcomes for this course.</td>
</tr>
</tbody>
</table>

**Level of Content Delivery:**

| (I) Introduced - Students are not expected to be familiar with the content or skills at the collegiate level. Instruction and learning activities focus on basic knowledge, skills, and/or competencies and entry-level complexity. Only one (or a few) aspect of a complex program outcome is addressed in the given course (score of 1). |
| (R) Reinforced - Students are expected to possess a basic level of knowledge and familiarity with the content or skills at the collegiate level. Instruction and learning activities concentrate on enhancing and strengthening knowledge, skills, and expanding complexity. Several aspects of the outcome are addressed in the given course, but these aspects are treated separately (score of 2). |
| (A) Advanced - Students are expected to possess a strong foundation in the knowledge, skill, or competency at the collegiate level. Instructional and learning activities continue to build upon previous competencies with increased complexity. All components of the outcome are addressed in the integrative contexts (score of 3). |

**Feedback on Student Performance / Assessment:**

| (F) Students are asked to demonstrate their learning on the outcome through homework, projects, tests, etc. and are provided formal feedback (score of 1). |

## SELECTED PROGRAM LEARNING OUTCOMES

<table>
<thead>
<tr>
<th>Date</th>
<th>12/15/2015</th>
</tr>
</thead>
</table>

**MS Atmospheric Sciences**

- Upon graduation student will have conducted an original piece of significant research
- Upon graduation, students can communicate effectively
- Upon graduation, students have demonstrated a thorough fundamental knowledge of topics in Atmospheric Science

### Courses in Degree Program

<table>
<thead>
<tr>
<th>Specialized Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMO 6000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[I] Outcome Statement (x)</th>
<th>[II] Level (L, R, A)</th>
<th>[III] Feedback (F)</th>
<th>[I] Outcome Statement (x)</th>
<th>[II] Level (L, R, A)</th>
<th>[III] Feedback (F)</th>
<th>[I] Outcome Statement (x)</th>
<th>[II] Level (L, R, A)</th>
<th>[III] Feedback (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>I</td>
<td>F</td>
<td>M</td>
<td>L, R</td>
<td>F</td>
<td>M</td>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
<td>F</td>
</tr>
</tbody>
</table>

Based on curriculum map from Norfolk State University. Distributed with permission by Alexei G. Malveev (agmalveev@nsu.edu)
# Texas Tech University Program Level - Curriculum Map

<table>
<thead>
<tr>
<th>Date</th>
<th>12/15/2015</th>
<th><strong>SELECTED PROGRAM LEARNING OUTCOMES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Upon graduation student will have conducted an original piece of significant research</td>
</tr>
</tbody>
</table>

### MS Geography

<table>
<thead>
<tr>
<th>Courses in Degree Program</th>
<th>[I] Outcome Statement (X, M)</th>
<th>[II] Level (L, R, A)</th>
<th>[III] Feedback (F)</th>
<th>[IV] Outcome Statement (X, M)</th>
<th>[V] Level (L, R, A)</th>
<th>[VI] Feedback (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 5312</td>
<td>M</td>
<td>I</td>
<td>F</td>
<td>X</td>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>GEOG 5340</td>
<td>X</td>
<td>R</td>
<td>F</td>
<td>X</td>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>Specialized Courses</td>
<td>M</td>
<td>R</td>
<td>F</td>
<td>X</td>
<td>R</td>
<td>F</td>
</tr>
<tr>
<td>GEOG 6000</td>
<td>X</td>
<td>A</td>
<td>F</td>
<td>X</td>
<td>A</td>
<td>F</td>
</tr>
</tbody>
</table>

### Legend

[I] OUTCOME STATEMENT:
The program outcome is (x) EXPLICITLY (score of 2) or (m) IMPLICITLY (score of 1) reflected in the course syllabus as being one of the learning outcomes for this course.

[II] LEVEL OF CONTENT DELIVERY:
- **INTRODUCED** - Students are not expected to be familiar with the content or skill at the collegiate level. Instruction and learning activities focus on basic knowledge, skills, and/or competencies and entry-level complexity. Only one (or a few) aspect of a complex program outcome is addressed in the given course (score of 1).
- **REINFORCED** - Students are expected to possess a basic level of knowledge and familiarity with the content or skills at the collegiate level. Instructional and learning activities concentrate on enhancing and strengthening knowledge, skills, and expanding complexity. Several aspects of the outcome are addressed in the given course, but these aspects are treated separately (score of 2).
- **ADVANCED** - Students are expected to possess a strong foundation in the knowledge, skill, or competency at the collegiate level. Instructional and learning activities continue to build upon previous competencies with increased complexity. All components of the outcome are addressed in the integrative contexts (score of 3).

[III] FEEDBACK ON STUDENT PERFORMANCE / ASSESSMENT:
- (F) Students are asked to demonstrate their learning on the outcome through homework, projects, tests, etc. and are provided formal feedback (score of 1).

Based on curriculum map from Norfolk State University. Distributed with permission by Alexei G. Matveev (agmatveev@nsu.edu)
APPENDIX C

18 Characteristics
(For the years under review)
18 Characteristics of Texas Public Doctoral Programs

Programs included only if in existence 3 or more years. Program is defined at the 8-digit CIP code level.

<table>
<thead>
<tr>
<th>Arts and Sciences</th>
<th>Department</th>
<th>Geosciences</th>
<th>Doctoral Degree Program</th>
</tr>
</thead>
</table>

1. **Number of Degrees Per Year**
   - For each of the three most recent years, of the number of degrees awarded per academic year.
   - FY 2011-2012: 2
   - FY 2012-2013: 1
   - FY 2013-2014: 1

2. **Graduate Rates**
   - For each of the three most recent years, of the percent of first-year doctoral students who graduated within ten years.
   - Fall 2011: 0%
   - Fall 2012: 0%
   - Fall 2013: 75%

3. **Average Time to Degree**
   - For each of the three most recent years, average of the graduates’ time to degree
   - FY 2011-2012: 4.4
   - FY 2012-2013: 8.3
   - FY 2013-2014: 7.3

4. **Employment Profile - (in field within one year of graduation)**
   - For each of the three most recent years, the number and percent of graduates by year employed, those still seeking employment, and unknown.
   - | Fall 2011 | Fall 2012 | Fall 2013 |
   - | Number | Percent | Number | Percent | Number | Percent |
   - | Employed in Academia | 0 | 0% | 1 | 8.30% | 3 | 42.80% |
   - | Employed as Post-Doctorates | 1 | 9% | 1 | 8.30% | 0 | 0% |
   - | Employed in Industry/Professional | 6 | 55% | 6 | 50.00% | 2 | 28.60% |
   - | Employed in Government | 1 | 9% | 0 | 0.00% | 2 | 28.60% |
   - | Still seeking employment | 0 | 0% | 1 | 8.30% | 0 | 0% |
   - | Unknown | 0 | 0% | 1 | 8.30% | 0 | 0% |

5. **Admissions Criteria**
   - Description of Admission Factors:
   - 1) Graduate School Application
   - 2) Official Transcripts
   - 3) Official copy of the TOEFL scores (for international students)
   - 4) Geosciences Application
   - 5) Official report of GRE scores
   - 6) Goals and Career objective
   - 7) Three letters of reference

6. **Percentage of Full-time Students**
   - FTSⁿumber students enrolled (headcount) for last three fall semesters.
   - Definition of Full Time Student (FTS) is institutional by program.
   - Fall 2011: 79%
   - Fall 2012: 77%
   - Fall 2013: 88%

7. **Average Institutional Financial Support Provided**
   - For those receiving financial support, the average monetary institutional support provided per full-time graduate student for the prior year from assistantships, scholarships, stipends, grants, and fellowships (does not include tuition or benefits).
   - Note: This number represents the weighted average monthly salary of all Research & Teaching Assistants and Graduate Part-Time Instructors.
   - Fall 2011: 2000/month
   - Fall 2012: 2000/month
   - Fall 2013: 2000/month

http://www.depts.ttu.edu/gesc/GEOSCI_Grad_App_Form.pdf

10/7/2015
8. Percentage Full-time Students with Institutional Financial Support

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In the prior year, the number of FTS with at least $1000 of annual support/the number of FTS.

9. Number of Core Faculty

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of core faculty in the prior years</td>
<td>26</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

Core faculty: Full-time tenured and tenure-track faculty who teach 50 percent or more in the doctoral program or other individuals integral to the doctoral program who can direct dissertation research.

10. Student-Core Faculty Ratio

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.82</td>
<td>0.71</td>
<td>0.79</td>
</tr>
</tbody>
</table>

For each of the three most recent years, average of full-time student equivalent (FTSE)/average of full-time faculty equivalent (FTFE) of core faculty.

11. Core Faculty Publications

For each of the three most recent calendar years, average of the number of discipline-related refereed papers/publications, books/book chapters, juried creative/performance accomplishments, and notices of discoveries filed/patents issued per core faculty member.

<table>
<thead>
<tr>
<th></th>
<th>Calendar Year 2011</th>
<th>Calendar Year 2012</th>
<th>Calendar Year 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refereed Papers/Publications</td>
<td>34</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>Books/Book Chapters</td>
<td>1</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Juried Creative/Performance Accomplishments</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Notices of Discoveries Filed/Patents</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

12. Core Faculty External Grants

For each of the three most recent years, average of the number of core faculty receiving external funds, average external funds per faculty, and total external funds per program per academic year.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Core Faculty receiving external funds</td>
<td>12</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Average External Grant $ per Faculty</td>
<td>$368,310</td>
<td>$177,576</td>
<td>$210,274</td>
</tr>
<tr>
<td>Total External Grant $</td>
<td>$4,419,720</td>
<td>$1,775,763</td>
<td>$2,523,293</td>
</tr>
</tbody>
</table>

13. Faculty Teaching Load

Total number of semester credit hours in organized teaching courses taught per academic year by core faculty divided by the number of core faculty.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300</td>
<td>287</td>
<td>275</td>
</tr>
</tbody>
</table>

14. Faculty Diversity

Core faculty by ethnicity (White, Black, Hispanic, other) and gender.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>White</td>
<td>12</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

15. Student Diversity

Enrollment headcount by ethnicity (White, Black, Hispanic, Other) and gender in program.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>White</td>
<td>8</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Date of Last External Review</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of last formal external review. ⁷</td>
<td></td>
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<tr>
<td>Six-year Texas Tech University Graduate Program Review</td>
<td></td>
<td></td>
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<tr>
<td>4/1/2010</td>
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<table>
<thead>
<tr>
<th>External Program Accreditation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of body and date of last program accreditation review, if applicable.</td>
</tr>
<tr>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Publications/Presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the three most recent calendar years, the number of discipline-related refereed papers/publications, juried creative/performance accomplishments, book chapters, books, and external presentations per year by student FTE</td>
</tr>
<tr>
<td>Calendar Year 2011</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Refereed Papers/Publications</td>
</tr>
<tr>
<td>Juried Creative/Performance Accomplishments</td>
</tr>
<tr>
<td>Book Chapters</td>
</tr>
<tr>
<td>Books</td>
</tr>
<tr>
<td>External Presentations</td>
</tr>
</tbody>
</table>
APPENDIX D

Graduate Course Offerings

Our graduate course offerings are located at the following website:

http://www.depts.ttu.edu/officialpublications/courses/geol.php
http://www.depts.ttu.edu/officialpublications/courses/gch.php
http://www.depts.ttu.edu/officialpublications/courses/gist.php
http://www.depts.ttu.edu/officialpublications/courses/geog.php
http://www.depts.ttu.edu/officialpublications/courses/gph.php
http://www.depts.ttu.edu/officialpublications/courses/atmo.php
The Graduate Committee in the Department of Geosciences is committed to helping you negotiate through the program. Progressing through the program at an optimal pace means keeping track of the requirements to graduate. Below are TTU websites that provide all of the information relating to academic requirements in the Graduate School.

**Official Graduate Catalog with most up-to-date information:**

**Official Graduate School Catalog information regarding the Graduate School Procedures:**
[http://www.depts.ttu.edu/officialpublications/catalog/GradSchool.php](http://www.depts.ttu.edu/officialpublications/catalog/GradSchool.php)

**Official Graduate School Catalog information on M.S. Programs:**
[http://www.depts.ttu.edu/officialpublications/catalog/GradMasters.php](http://www.depts.ttu.edu/officialpublications/catalog/GradMasters.php)

**Official Graduate School Catalog information on Ph.D. Programs:**
[http://www.depts.ttu.edu/officialpublications/catalog/GradDoctoral.php](http://www.depts.ttu.edu/officialpublications/catalog/GradDoctoral.php)

**Official Graduate School Catalog information on Graduate Degrees in Geosciences:**
[http://www.depts.ttu.edu/officialpublications/catalog/AS_GEO.php#Grad](http://www.depts.ttu.edu/officialpublications/catalog/AS_GEO.php#Grad)

Good luck!

The Department of Geosciences Graduate Committee,

Callum Hetherington, Associate Professor  
[callum.hetherington@ttu.edu](mailto:callum.hetherington@ttu.edu)

Juske Horita, Professor  
[juske.horita@ttu.edu](mailto:juske.horita@ttu.edu)

Jim Barrick, Professor  
[jim.barrick@ttu.edu](mailto:jim.barrick@ttu.edu)
Master's Program in Geosciences

Guidelines

1. LEVELING
   i. All entering master's students are expected to have completed mathematics and science courses equivalent to those required for the B.S. degree in geosciences at Texas Tech University. Students lacking mathematics and science courses will be required to enroll in appropriate courses for leveling purposes. Courses completed to fulfill leveling requirements will not be applied towards the MS degree, unless they carry graduate credit.
   ii. Students entering the master's program with a B.S. in a subject other than Geosciences are expected to enroll and complete a selection of geoscience courses recommended by their supervisor and the graduate committee. Courses completed to fulfill leveling requirements will not be applied towards the MS degree unless they carry graduate credit.
   iii. While fulfilling any leveling requirements a new M.S. student is free to take graduate courses that are part of their degree plan so long as they have fulfilled any prerequisites and have the permission of the instructor.

2. COURSE WORK
   Requirements:
   i. A total of thirty-six hours of course work are required for the master's degree.
   ii. Of the required thirty-six hours, twenty-four hours of graduate course work must be completed.
   iii. A minimum of nineteen hours of graduate course work must be completed in the Department of Geosciences.
   iv. No more than 6 hours of individual studies (GEOL 5300) or research (GEOL 7000) should be used to satisfy the course work requirement unless the 5300 course carries a specific title (i.e., an organized class).
   v. Each student is required to enroll in the GEOL 5101 – Seminar course during their first year of study.
   vi. A total of six hours of graduate course work in related fields of science (e.g., engineering, mathematics, computer science and related disciplines) may be applied towards the twenty-four hour graduate requirement. Students must check with the graduate advisor concerning the appropriateness of these courses.
   vii. Graduate students supported by the department are required to register for 12 credit hours per long semester (3 credit hours per summer session of support). Students who are self-supported or registered as grant supported Research Assistants must register for at least 9 credit hours per long semester to be considered full time students.
In addition, before the start of the student’s second year of study a thesis proposal must be prepared, distributed, and approved by all committee members, and a copy lodged with the Graduate Committee. All committee members must complete the appropriate proposal assessment form, which must be filed in the Department office at the beginning of the student’s second year in the M.S. program. If the thesis proposal is not completed by the beginning of the third semester then the T.A. support may be withdrawn by the Geosciences Department.

4. MASTER’S THESIS

i. Upon completion of the above steps the student may enroll in GEOL 6000 – MS thesis. Note that six hours of GEOL 6000 must be taken.

ii. Inform the Graduate School of the intent to graduate at least 12 weeks prior to the graduation date. The “Statement of Intention to Graduate” form must be filed no later than the deadline date for that semester, the applicable dates are posted by the Graduate School. When this form is filed students will receive additional information and forms from the Graduate School. Be certain that all forms are correctly filed by the Graduate School deadlines.

iii. Follow guidelines established by the Graduate School in preparing the thesis. If there are any questions or unusual formats, obtain approval of the Graduate School before preparing the final copies of the thesis.

iv. Complete copies (text with all figures and illustrations) must be distributed to all committee members at least two weeks before the date of the thesis defense. Note that the defense must occur before the Graduate School deadline for reporting examination results for that semester.

v. Place one copy of the completed thesis in the Reading Room one week before the defense date;

vi. Announcements of the time and place of the defense should be posted around the department 1 week prior to the defense date.

vii. The student, if they so wish, may select a member of the Graduate Faculty to chair their thesis defense. The chair of the defense is an impartial participant in the process and is responsible for introducing the candidate before their public presentation, and chairing the two portions of the question and answer session. The chair may ask questions, but their primary role is to ensure a fair and impartial discussion occurs between the candidate, audience and examination committee.

viii. The thesis defense has two parts. First, the candidate will make a public presentation of their thesis research. The presentation should be approximately 30 minutes in length. Following the presentation the audience may ask questions. Then the candidate will be examined more thoroughly by members of the thesis
**M.S. PROGRAM TIMELINE**

**STEP 1. PRIOR TO FIRST LONG SEMESTER.**
- Meet with potential faculty member(s) in your area of research interest and discuss and register for first semester courses and discuss thesis topics.

**STEP 2. DURING FIRST LONG SEMESTER.**
1) Identify thesis advisor and form preliminary thesis committee.
2) Prepare a list of courses to be taken during matriculation through the M.S. program in consultation with the preliminary thesis committee. File the "Geosciences Master's of Science Course Plan".

**STEP 3. DURING SECOND LONG SEMESTER:**
1) Finalize thesis topic
2) Finalize thesis committee

**STEP 4. BY THE END OF THE SECOND LONG SEMESTER.**
- In consultation with thesis committee, submit the "Program for the Master's Degree & Admission to Candidacy" (degree plan).

**STEP 5. BEFORE THE START OF THE SECOND YEAR.**
1) Prepare and submit thesis proposal for thesis committee approval.
2) Submit approved thesis proposal to Graduate Committee.

**STEP 6. DURING THIRD LONG SEMESTER.**
- Organize meeting with thesis committee and present research progress report.
- Enroll in 6 hours of GEOL 6000.

**STEP 7. FOURTH SEMESTER.**
- File "Statement of Intention to Graduate" prior to University deadline.
1. The student will begin taking courses to meet the appropriate tool subject(s).
2. Incoming students will identify the faculty member (the *faculty advisor*) with whom they intend to work. In the unusual circumstance in which the student has not identified a likely faculty advisor, the Graduate Advisor will appoint one.

*Second long semester in residence.*

1. The student and their faculty advisor will choose two research subjects on which the student will conduct literature research during the first semester. They will also choose an examining committee that will evaluate the research.
2. The student will write pre-proposals on the two research topics. **These pre-proposals will be presented to the examining committee and defended orally before the end of the semester.** The committee will evaluate the quality of the pre-proposal and the student's oral presentation. The faculty advisor will report the results of their evaluation to the student and to the Graduate Advisor in writing no later than the beginning of following semester.

*Third long semester in residence.*

1. The student and faculty advisor will choose a research subject, normally one of the topics reported on during the second semester.
2. The student will write an NSF-style research proposal on the chosen research topic. This proposal will be presented to the examining committee and defended orally during the week prior to final exams.
3. **Before the end of the semester,** the committee will evaluate the quality of the proposal and of the student's oral defense. At this time, the committee will also determine whether the student should continue toward the Ph.D. degree.

If their decision is negative, the student will be so informed in writing by the Graduate Advisor. Furthermore, failure to meet any of the requirements stipulated above in the first three long semesters in residence may be grounds for recommending withdrawal of departmental financial support.

*Before the beginning of the fourth long semester in residence.*

1. The degree plan will be filed with the Graduate School. At this time, the student will formalize the dissertation topic and committee. Under normal circumstances, the committee will consist of between 3 and 5 members, including the faculty advisor.

**Comprehensive Examination**

The purpose of the Comprehensive Exam is to determine whether the student has the appropriate background in, and understanding of, their chosen research field and whether research on their dissertation topic should continue. **The Comprehensive Exam will be completed before the end of the fourth long semester in residence.**
STEP 4. BY THE END OF THE FOURTH LONG SEMESTER.
1) Complete Comprehensive Exam (written & oral). In consultation with thesis committee, submit the “Program for the Master’s Degree & Admission to Candidacy” (degree plan).

STEP 5. ADVANCEMENT TO CANDIDACY
1) Prepare and submit thesis proposal for thesis committee approval.
2) Submit approved thesis proposal to Graduate Committee.

STEP 6. FIFTH THROUGH EIGHTH LONG SEMESTERS
1) Conduct and complete research.
2) Begin enrolling in GEOL 8000, Dissertation, not more than 12 hours; once you enroll in GEOL 8000, you must keep enrolling until graduation.
3) Complete Dissertation.
## GEOSCIENCE GRADUATE COURSE LIST

<table>
<thead>
<tr>
<th>Course</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Required of all students</strong></td>
</tr>
<tr>
<td>GEOL</td>
<td>5101 Seminar</td>
</tr>
<tr>
<td></td>
<td><strong>I. Geochemistry, Mineralogy, Petrology</strong></td>
</tr>
<tr>
<td>GCH</td>
<td>5300 Diagenesis &amp; Low-T Metamorphism</td>
</tr>
<tr>
<td>GCH</td>
<td>5300 Geochemistry of Radiogenic Isotopes</td>
</tr>
<tr>
<td>GCH</td>
<td>5303 Trace Element Geochemistry</td>
</tr>
<tr>
<td>GCH</td>
<td>5304 Advanced Problems in Geochemistry</td>
</tr>
<tr>
<td>GCH</td>
<td>5305 Environmental and Aqueous Geochemistry</td>
</tr>
<tr>
<td>GCH</td>
<td>5350 Isotope Geochemistry</td>
</tr>
<tr>
<td>GCH</td>
<td>5405 Inorganic Geochemistry</td>
</tr>
<tr>
<td>GEOL</td>
<td>5300 Igneous and Metamorphic Petrography</td>
</tr>
<tr>
<td>GEOL</td>
<td>5300 Optical Mineralogy</td>
</tr>
<tr>
<td>GEOL</td>
<td>5303 Advanced Igneous Petrology</td>
</tr>
<tr>
<td></td>
<td><strong>II. Sedimentology, Stratigraphy, Paleontology</strong></td>
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<tr>
<td>GEOL</td>
<td>5300 Sedimentology and Stratigraphy</td>
</tr>
<tr>
<td>GEOL</td>
<td>5311 Micropaleontology</td>
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<tr>
<td>GEOL</td>
<td>5314 Problems in Stratigraphy</td>
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<tr>
<td>GEOL</td>
<td>5322 Sedimentary Processes</td>
</tr>
<tr>
<td>GEOL</td>
<td>5327 Problems in Paleontology</td>
</tr>
<tr>
<td>GEOL</td>
<td>5410 Vertebrate Paleontology</td>
</tr>
<tr>
<td>GEOL</td>
<td>5420 Geological Correlation</td>
</tr>
<tr>
<td>GEOL</td>
<td>5422 Sedimentary Geology of Carbonates</td>
</tr>
<tr>
<td>GEOL</td>
<td>5424 Clastic Sedimentology</td>
</tr>
<tr>
<td>GEOL</td>
<td>5426 Sequence Stratigraphy</td>
</tr>
<tr>
<td></td>
<td><strong>III. Structure, Tectonics, Geophysics, and Petrophysics</strong></td>
</tr>
<tr>
<td>GEOL</td>
<td>5325 Petrophysics</td>
</tr>
<tr>
<td>GEOL</td>
<td>5361 Advanced Structural Geology</td>
</tr>
<tr>
<td>GEOL</td>
<td>5362 Advanced Tectonics</td>
</tr>
<tr>
<td>GEOL</td>
<td>5399 Advanced Petrophysics</td>
</tr>
<tr>
<td>GPH</td>
<td>5221 Advanced Seismic Exploration Methods</td>
</tr>
<tr>
<td>GPH</td>
<td>5223 Advanced Applied Electrical Methods</td>
</tr>
<tr>
<td>GPH</td>
<td>5231 Seismology</td>
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<tr>
<td>GPH</td>
<td>5233 Electrical Methods</td>
</tr>
<tr>
<td>GPH</td>
<td>5300 Geodynamics &amp; Petroleum Systems Of Sedimentary Basins</td>
</tr>
<tr>
<td>GPH</td>
<td>5xxx Geophysical Data Processing</td>
</tr>
<tr>
<td>GPH</td>
<td>5xxx Physics Of The Earth</td>
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<tr>
<td>GPH</td>
<td>5xxx Advanced Quantitative Seismology</td>
</tr>
<tr>
<td>GPH</td>
<td>5xxx Advanced Geophysics (repeatable)</td>
</tr>
<tr>
<td>GPH</td>
<td>5xxx Seismic Interpretation</td>
</tr>
<tr>
<td></td>
<td><strong>IV. Methods</strong></td>
</tr>
<tr>
<td>GEOL</td>
<td>5310 Advanced Quantitative Methods</td>
</tr>
<tr>
<td>GEOL</td>
<td>5341 Digital Imagery in Geosciences</td>
</tr>
<tr>
<td>GEOL</td>
<td>5342 Spatial Data Analysis &amp; Modeling in Geosciences</td>
</tr>
<tr>
<td>GEOL</td>
<td>5428 GIS in Natural Science and Engineering</td>
</tr>
</tbody>
</table>
TEXAS TECH UNIVERSITY–THE GRADUATE SCHOOL
PROGRAM FOR THE MASTER’S DEGREE AND ADMISSION TO CANDIDACY

After admission to a degree program, every applicant for the master’s degree is required to complete and submit one copy of this form to the Graduate School for approval before the second semester of enrollment in the program.

Full legal name ____________________________ Student’s I.D.# ____________________________

Current mailing address (include zip code) ______________________________________________

Degree sought ____________________________ Major ____________________________ Expected Graduation Date ____________________________

Previous Degree(s) ____________________________ Institution(s) ____________________________ Year(s) Awarded ____________________________

Circle one: Non-Thesis Thesis (Complete committee and thesis title sections below—not for report option.)

Thesis committee (at least two Graduate Faculty members; indicate chairperson):

Thesis title (if known at this time, otherwise list area of thesis research):

Coursework (prefix and number as it appears in catalog or on official transcript): See TTU Graduate Catalog for hours required for degree sought.

<table>
<thead>
<tr>
<th>Major</th>
<th>Minor</th>
<th>Tool or Language</th>
<th>Leveling</th>
<th>Transfer Courses*</th>
<th>TTU equiv.#*</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-hr. min.</td>
<td>6-hr. min.</td>
<td>(if declared)</td>
<td>(if required)</td>
<td>Institution</td>
<td></td>
</tr>
</tbody>
</table>

*In order for transfer courses to be entered on the TTU transcript, courses must be given the TTU equivalent number. For example, MGMT 630 at TAMU may be equivalent to MGT 5371 at TTU. Please indicate when course was (or will be) taken and provide an official transcript to the Graduate School. No more than 6 hours may be transferred on a 36-hr., and 9 on a 45-hr program. Grades from transfer courses will not appear on TTU transcripts. Grades below B are not accepted on transfer work.

Signature of Graduate Advisor of major department ____________________________

Signature of Graduate Advisor of minor dept. (if declared) ____________________________

Graduate Dean ____________________________ Date ____________________________

Approved [ ] Conditional Approval [ ] Not Approved [ ]

Remarks or Conditions of Approval:

Approval of this form by the Dean of the Graduate School merely indicates that the proposed program is acceptable; it carries no assurance of the applicant’s attainment of a degree. Changes to this program may be made only with the approval of the department concerned and the Graduate School, using the form available in the Graduate School. Conditions for approval for admission to candidacy must be met before the proposed semester of graduation. Revised 5/14/02.
TEXAS TECH UNIVERSITY
GRADUATE STUDY
IN
ATMOSPHERIC SCIENCE

"REDBOOK"

Revised October, 2014
TEXAS TECH UNIVERSITY
GRADUATE STUDY IN ATMOSPHERIC SCIENCE

Atmospheric Science is an academic area within the Department of Geosciences of the College of Arts and Sciences. For information concerning graduate study and assistantships in Atmospheric Science, write or call:

Dr. Christopher Weiss, Graduate Advisor
Atmospheric Science Group
Texas Tech University
Box 41053
Lubbock, Texas 79409-2101

or visit our web site at www.atmo.ttu.edu.

GRADUATE FACULTY IN ATMOSPHERIC SCIENCE

Brian Ancell, Assistant Professor, Ph.D. University of Washington, 2006
Eric Bruning, Assistant Professor, Ph.D. University of Oklahoma, 2008
Johannes Dahl, Assistant Professor, Ph.D. Ludwig Maximilians University, 2010
Song-Lak Kang, Assistant Professor, Ph.D. Pennsylvania State University, 2007
John L. Schroeder, Associate Professor, Ph.D. Texas Tech University, 2001
Jennifer Vanos, Assistant Professor, Ph.D. University of Guelph, 2011
Chris C. Weiss, Assistant Professor, Ph.D. University of Oklahoma, 2004

STATEMENT OF PHILOSOPHY

Graduate study in Atmospheric Science at Texas Tech is a rigorous program designed to provide instruction in the science of meteorology for professionals in research, operational activities, and education. The ultimate objective of this program is to produce graduates whose understanding of problems and solutions in meteorology makes them uniquely qualified to apply their expertise for the betterment of society. To accomplish this goal, a program focused on convective processes is offered. Areas of research include: precipitation structure of mesoscale convective systems including analysis of dual-Doppler weather radar data; the nature of severe storms such as hailstorms, hurricanes, tornadoes, and dust storms initiating mechanisms for convection (fronts, drylines, outflow boundaries); boundary layer meteorology and turbulence modeling, land-atmosphere interactions, air pollution meteorology, wind engineering and wind energy applications; and regional and mesoscale numerical weather prediction and data assimilation. Within this general objective, each student may pursue individualized educational objectives and professional goals.

The graduate program is a vital area of growth for both faculty and students. To insure healthy growth, students are encouraged to advance new ideas and to participate in the academic and professional activities provided by the area and the discipline. The faculty firmly believes that Texas Tech provides the challenges and opportunities necessary for successful study in Atmospheric Science.

Texas Tech is committed to the principle that in no aspect of its program shall there be differences in the treatment of persons because of race, creed, national origin, age, sex or disability and that equal opportunity and access to facilities shall be available to all.

Persons with disabilities who may need auxiliary aids or services are requested to contact Debbie Walker at 806-742-3113, preferably several weeks in advance of participation so that appropriate arrangements can be made.
TEACHING ASSISTANTSHIPS

Teaching assistantships are available for qualified applicants. A half-time teaching assistant teaches three laboratory sections each fall and spring semester. The teaching assistantship program provides the opportunity for students to acquire teaching skills as well as gain greater mastery of topics in Atmospheric Science.

A student must be enrolled full time at least twelve semester hours each fall and spring semester to hold a teaching assistantship. The University requires that a student maintain continuous enrollment throughout (including summers), normally at least three hours during the semester of completion. See Registration/Enrollment Requirements section in this book for more details. Teaching appointments are available for the two-year period following admission to the degree program. Out-of-state tuition and fees are waived.

Teaching assistants are generally on the same schedule as faculty and must be in the office one week before the start of classes. They are expected to spend the equivalent of twenty hours per week on their duties (for a half-time appointment). Office hours should amount to at least three hours per week, posted on the office door.

Teaching assistants are free during times when class is not in session and after their grade rolls are submitted and are posted on the university's system at the end of the semester. There is no paid vacation accrual for part-time employment.

RESEARCH ASSISTANTSHIPS

Half-time research assistantships are available to qualified applicants. These appointments allow students to participate in research projects within the Department, which are administered by the project directors. A student must be enrolled full time (at least twelve semester hours) each fall and spring semester to hold a research assistantship. The University requires that a student maintain continuous enrollment throughout (including summers), normally at least three hours during the semester of completion. See Registration/Enrollment Requirements section in this book for more details. Out-of-state tuition and fees are waived.

Research assistants should be in the office at the beginning of the semester. They are expected to work the equivalent of twenty hours per week (for a half-time appointment), including times when classes are not in session and during holidays. The specific duties and time arrangements should be worked out with the faculty advisor at the beginning of each semester. There is no paid vacation accrual for part-time employment.

ADMISSION TO GRADUATE STUDY

General admission to the Graduate School

Forms for admission and instructions for completing the application process can be found at http://www.depts.ttu.edu/gradschool/forms.php. In addition to the formal application, students should submit transcripts of all previous academic work and scores from the Aptitude Test of the Graduate Record Examination (GRE). These documents should be submitted at least 60 days prior to the proposed enrollment.

Admission to a graduate degree program

Admission to a graduate degree program is granted by the Dean of Graduate School with the recommendation of the program area. Students should contact the Atmospheric Science Group directly to obtain the information and forms necessary for admission into the Atmospheric Science graduate degree program. All students admitted to the program will be considered for available financial aid.
REGISTRATION

Procedures for registration are set by the Registrar who furnishes each enrollee complete instructions for all steps in the procedure. In addition, each student must consult with the Graduate Advisor in Atmospheric Science and receive permission to enroll prior to registration. The University requires that a student maintain continuous enrollment (including summer) through the semester of graduation; the student must normally enroll for at least three hours during the semester of completion.

MASTER OF SCIENCE DEGREE

Atmospheric Science students may earn a Master of Science degree by developing and carrying out an academic and research program with the assistance of a Thesis Director from the Atmospheric Science faculty.

DEGREE REQUIREMENTS

Requirements of the academic program of study:

1. Students are required to have completed a course in Ordinary Differential Equations at undergraduate level prior to beginning the ATMO M.S. Degree Program. Partial Differential Equations may be similarly required at the discretion of the student's thesis committee, which may be taken concurrently with the ATMO degree coursework.

2. A minimum 31 hours of graduate level course work (5 courses per academic year) plus six hours of ATMO 6000 (Master's Thesis). Seminar counts for one (1) hour total towards the requirement. Total student credit load should be equal to 12 hours for each long semester. Other courses outside of the Atmospheric Science curriculum can be taken with prior departmental approval. Descriptions of the Atmospheric Science graduate courses are located at the end of this brochure.

   ATMO 5101 (Atmospheric Science Seminar)  G PH 5310 (Geophysical Fluid Dynamics)
   ATMO 5301 (Individual Studies)  G PH 5324 (Radiative Transfer)
   ATMO 5302 (Weather, Climate and Applications)  GEOL 8000 (Doctor's Dissertation)
   ATMO 5316 (Dynamics of Severe Storms)
   ATMO 5319 (Boundary Layer Meteorology)
   ATMO 5321 (Cloud and Precipitation Physics)
   ATMO 5322 (Atmospheric Electricity)
   ATMO 5327 (Radar Meteorology)
   ATMO 5328 (Synoptic Meteorology)
   ATMO 5331 (Analysis of Geophysical Data Fields)
   ATMO 5332 (Regional Scale Numerical Weather Prediction)
   ATMO 5351 (Meteorological Data Acquisition & Instrumentation Systems)
   ATMO 5353 (Meteorologic Field Experiments)
   ATMO 6000 (Master's Thesis)
   ATMO 7000 (Research)

3. Before the second semester of enrollment in graduate study, the student is required to prepare the "Program for the Master's Degree and Admission to Candidacy" (see form included or find at www.depts.ttu.edu/gradschool/Forms.php) This program is to be chosen with the assistance of the Thesis Director and approval of the Graduate Advisor.

4. Before the second semester of enrollment in graduate study, the student is required to submit the "Program for the Master's Degree and Admission to Candidacy" to the Graduate School. (See "The Master's Degree List of Major Steps Required by the Graduate School" form included or at the website listed in #2 above.)
5. An oral examination and thesis defense are required of all students.
6. There is no foreign language requirement.
7. All work for the Master's degree must be completed within six years.

Requirements for completing a thesis:
1. In consultation with faculty members, the student should select an area for research under supervision of the Thesis Director.
2. In consultation with the Thesis Director, the student will select at least two additional Thesis Committee members.
3. The student will prepare a thesis proposal to be approved by the Thesis Committee which shall contain:
   a. a statement of the objective of the study, 
   b. a justification of the study, 
   c. a clear and complete statement of the methodology to be followed in completing the study, and 
   d. additional material as recommended by the Thesis Director.
4. The student will conduct the research defined in the thesis proposal and approved by the Thesis Committee. The student should work closely with the Thesis Director during this period and meet with the Thesis Committee as often as necessary.
5. The MLA Style Sheet is the approved style guide for Atmospheric Science. The writer should also consult the booklet Instructions for Preparing and Submitting Theses and Dissertations, prepared by the Graduate School Staff. The TTU Thesis and Dissertation Manual is available at Barnes and Noble, the campus bookstore or on the Graduate School web site.
   http://www.depts.ttu.edu/gradschool/students/current/thd.php
6. Beginning with the Spring 2005 semester, ETD is the required format for the final copy submission of a thesis or dissertation. The student should visit http://www.depts.ttu.edu/gradschool/students/current/thd.php to learn more about this and other requirements for thesis or dissertation submission.
7. A student hoping to complete the degree within two years should plan to:
   a. select a Thesis Director during the first semester, 
   b. select and meet with the Thesis Committee during the second semester to outline the thesis problem, and 
   c. meet with the Committee early during the second semester of the second year before completing the thesis.

FINAL NOTE

Responsibility for meeting all degree requirements ultimately rests with the individual graduate student. Each student should be thoroughly familiar with the graduate catalog, which is essentially a contract between the student and the University governing degree requirements. Every attempt will be made to insure that each graduate student receives the opportunity to develop the type of program which will be most beneficial to the student, the University, and the profession of Atmospheric Science.

Though limited substitutions of ATMO courses are permitted with approval of the student's committee before enrollment in the course, no student seeking a graduate degree in Atmospheric Science is allowed to drop an ATMO course after enrolling.

Graduate students are required to maintain a 3.0 GPA or better for each semester. Failure to do so will result in the student being placed on academic probation. Failure to maintain a 3.0 GPA or better in the next semester will result in academic suspension from further enrollment as a graduate student or in graduate courses at Texas Tech.
DOCTOR OF PHILOSOPHY DEGREE

Atmospheric Science students may earn a Doctor of Philosophy degree by specializing in the integrated studies in earth and atmospheric sciences program of the Department of Geosciences. Each student develops an academic and research program with the assistance of a Dissertation Director from the Atmospheric Science faculty.

Graduate students whose academic performance and M.S. research are of superior quality are encouraged to submit a written request to the graduate advisor for admission to the Ph.D. program. Admission to the Ph.D. program is contingent upon completing all requirements (including the thesis) for the M.S. degree, identification of a faculty member to supervise the Ph.D. research, and identification of a suitable dissertation topic. The request may be submitted as soon during the M.S. program as the student wishes to express the desire to be considered for the Ph.D. program.

Degree Requirements

Requirements of the academic program of study:

All requirements for the Ph.D. degree are in accordance with those stipulated by the Graduate School and the Department of Geosciences. Please consult the graduate catalog for details. Conditions specific to the Atmospheric Science program are listed below. Any further requirements are determined by the student’s Dissertation Director and Committee.

The preliminary examination is to be taken as early in the doctoral study as possible. The specific requirements of the preliminary examination (oral or written or both) will be determined by the Dissertation Director.

Requirements for completing a dissertation:

1. In consultation with the Dissertation Director, the student should select a specific research problem.
2. In consultation with the Dissertation Director, the student will select at least two additional Dissertation Committee members, one for the minor area.
3. The student will prepare a dissertation proposal which shall contain:
   a. a statement of the objective of the study,
   b. a justification of the study,
   c. a clear and complete statement of the methodology to be followed in completing the study, and
   d. additional material as recommended by the Dissertation Director.
4. The student will conduct the research defined in the dissertation proposal and by the Dissertation Committee. The student should work closely with the Dissertation Director during this period and meet with the Dissertation Committee as often as necessary.
5. The MLA Style Sheet is the approved style guide for Atmospheric Science. The writer should also consult the booklet Instructions for Preparing and Submitting Theses and Dissertations, prepared by the Graduate School Staff. The TTU Thesis and Dissertation Manual is available at Barnes and Noble, the campus bookstore or on the Graduate School web site. http://www.depts.ttu.edu/gradschool/students/current/thd.php
6. Beginning with the Spring 2005 semester, ETD’s will be the required format for the final copy submission of a thesis or dissertation. The student should visit http://www.depts.ttu.edu/gradschool/students/current/thd.php to learn more about this and other requirements for thesis or dissertation submission.
7. A student hoping to complete the degree within two years should plan to:
   a. select a Thesis Director during the first semester,
   b. select and meet with the Thesis Committee during the second semester to outline the thesis problem, and
   c. meet with the Committee early during the second semester of the second year before completing the thesis.
FINAL NOTE

Responsibility for meeting all degree requirements ultimately rests with the individual graduate student. Each student should be thoroughly familiar with the graduate catalog which is essentially a contract between the student and the University governing degree requirements. Every attempt will be made to insure that each graduate student receives the opportunity to develop the type of program which will be most beneficial to the student, the University, and the profession of Atmospheric Science.

Graduate students are required to maintain a 3.0 GPA or better for each semester. Failure to do so will result in the student being placed on academic probation. Failure to maintain a 3.0 GPA or better in the next semester will result in academic suspension from further enrollment as a graduate student or in graduate courses at Texas Tech.

GRADUATE COURSES IN ATMOSPHERIC SCIENCE

5101. Atmospheric Science Seminar (1:1:0). Discussions of current research or selected topics of interest. May be repeated for credit.

5301. Individual Studies in Atmospheric Science (3:3:0). Prerequisite: Consent of instructor. A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.

5302. Weather, Climate, and Applications (3:3:0). Basic principles of atmospheric science, with particular emphasis on applications, including severe weather, air pollution, and global climate change.

5316. Dynamics of Severe Storms (3:3:0). Observations and theoretical studies of severe storms. Conceptual and numerical models of storm structure and development.

5319. Boundary Layer Meteorology (3:3:0). Boundary-layer turbulent transfer processes are examined, including diffusion, mixing, diabatic modification, low-level jet formation, and moisture discontinuities.

5321. Cloud and Precipitation Physics (3:3:0). Processes of cloud droplet nucleation; initial growth of droplets and cloud droplet size spectra; theories of natural precipitation processes and techniques for precipitation enhancement.

5322. Atmospheric Electricity (3:3:0). Electrical processes in the atmosphere and in weather; ionosphere and global circuit, storm electrification, lightning physics and phenomenology, relationships between lightning and convection, measurement.

5327. Radar Meteorology (3:3:0). Applications of radar to investigation of precipitating weather systems. Emphasis is given to analysis and interpretation of radar data in conjunction with other data sources.

5328. Synoptic Meteorology (3:2:3). Basic techniques of interpreting meteorological data. Applications of analysis techniques to basic research and weather forecasting.

5331. Analysis of Geophysical Data Fields (3:3:0). The application of Fourier analysis, data assimilation, and objectives analysis to geophysical data fields.

5332. Regional Scale Numerical Weather Prediction (3:3:0). Regional scale dynamics, numerical solution of geophysical problems, and numerical prediction of severe weather events such as tornadic storms and flash floods.
5351. Meteorological Data Acquisition and Instrumentation Systems (3:2:3). Exploration, design, integration and application of meteorological data acquisition and instrumentation systems.

5353. Meteorologic Field Experiments (3:3:0). An overview of designing, planning, and completing atmospheric field experiments.

6000. Master's Thesis (V1-6).

7000. Research (V1-12).

GEOL 8000. Doctor's Dissertation.


G PH 5324. Radiative Transfer (3:3:0). Principles of radiation, the radiative transfer equation. Applications to absorption, emission, and scattering processes. Determination of physical properties from satellite measurements.

REGISTRATION/ENROLLMENT REQUIREMENTS

Following is a guideline of the minimum requirements of both the department and the Graduate School.

Supported Students:
- Fall & Spring: 12 hours per session
- Summer I & II: 3 hours per session

Non-Supported Students:
- Fall & Spring: 12 hours per session
- Summer I & II: 1 hour minimum for either Summer I or Summer II (both not required)

If you have begun 6000 coursework –
If you have not begun 6000 coursework –

no registration requirements unless otherwise indicated by advisor

Requirements for doctoral students differ – please consult with your advisor and the graduate catalog which can be found at:
http://www.depts.ttu.edu/officialpublications/catalog/_viewcat.php
# Required Steps for the MASTER’S DEGREE

<table>
<thead>
<tr>
<th>ACTION</th>
<th>INITIATED THROUGH</th>
<th>SUBMITTED TO</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Plan courses for degree</td>
<td>Graduate Advisor</td>
<td>Graduate Advisor</td>
<td>Prior to registration</td>
</tr>
<tr>
<td>2 Set up thesis advisory committee and title, if applicable</td>
<td>Graduate Advisor</td>
<td>Graduate Advisor</td>
<td>Prior to filing &quot;Program for the Master's Degree and Admission to Candidacy&quot; form</td>
</tr>
<tr>
<td>3 File &quot;PROGRAM FOR THE MASTER'S DEGREE AND ADMISSION TO CANDIDACY&quot; form (Not to be confused with the &quot;Statement of Intention to Graduate&quot; form, see #6 below)</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Graduate School Enrollment Management</td>
<td>After first semester of master's coursework, no later than the posted deadline</td>
</tr>
<tr>
<td>4 File changes in degree program, as necessary</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Graduate School Enrollment Management</td>
<td>As needed</td>
</tr>
<tr>
<td>5 Enroll in semester of graduation (at least 3 hours of thesis, if defending thesis)</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Registrar</td>
<td>Semester of graduation</td>
</tr>
<tr>
<td>6 File &quot;STATEMENT OF INTENTION TO GRADUATE&quot; form, including official title of thesis, if applicable. (Not to be confused with the &quot;Program for Master's Degree and Admission to Candidacy&quot; form see #3 above)</td>
<td>Student</td>
<td>Graduate School Enrollment Management</td>
<td>Semester of graduation (One must be filed for each intended graduation semester)</td>
</tr>
<tr>
<td>7 Schedule final comprehensive examination and/or defense. Send email to the Thesis Coordinator indicating the time and date of the defense.</td>
<td>Student</td>
<td>Graduate School Thesis Coordinator</td>
<td>Semester of graduation (usually about 6 weeks before graduation)</td>
</tr>
<tr>
<td>8 After the exam, the advisor sends REPORT ON COMPREHENSIVE EXAM FORM to Enrollment Management.</td>
<td>Graduate Advisor (non-thesis option)</td>
<td>Graduate School Enrollment Management</td>
<td>By posted deadline</td>
</tr>
<tr>
<td>9 After defense, obtain committee signatures on the ORAL DEFENSE and THESIS-DISSERTATION APPROVAL FORM and submit to Graduate School</td>
<td>Student (thesis option)</td>
<td>Graduate School Thesis Coordinator</td>
<td>Prior to deadline during semester of graduation</td>
</tr>
<tr>
<td>10 Pay Thesis-Dissertation fee, if applicable</td>
<td>Student (thesis option)</td>
<td>Student Business Services</td>
<td>Prior to deadline during semester of graduation</td>
</tr>
<tr>
<td>11 After incorporating committee changes, submit .pdf file of thesis to the ETD site for official review</td>
<td>Student (thesis option)</td>
<td>Graduate School Thesis Coordinator</td>
<td>Semester of graduation (usually 5 weeks before graduation date)</td>
</tr>
<tr>
<td>12 Final grade for thesis hours (A or B) Grade will be &quot;CR&quot; until final semester</td>
<td>Chair, Advisory Committee</td>
<td>Registrar</td>
<td>End of semester</td>
</tr>
<tr>
<td>13 Submit official .pdf of thesis to ETD web site (MM students submit PDF programs to ETD site and turn CDs of performances in to the Graduate School)</td>
<td>Student</td>
<td>Graduate School Thesis Coordinator</td>
<td>Prior to deadline</td>
</tr>
</tbody>
</table>

Revised 2/22/2012
<table>
<thead>
<tr>
<th>ACTION</th>
<th>INITIATED THROUGH</th>
<th>SUBMITTED TO</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Plan courses for degree</td>
<td>Graduate Advisor</td>
<td>Graduate Advisor</td>
<td>Prior to registration</td>
</tr>
<tr>
<td>2 Take preliminary exam (option)</td>
<td>Graduate Advisor</td>
<td>Graduate School Enrollment Management</td>
<td>Early in doctoral study, usually first semester of coursework</td>
</tr>
<tr>
<td>3 Set up doctoral advisory committee and title</td>
<td>Graduate Advisor</td>
<td>Graduate School Enrollment Management</td>
<td>Prior to filing doctoral degree plan</td>
</tr>
<tr>
<td>4 File &quot;PROGRAM FOR THE DOCTORAL DEGREE&quot; form</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Graduate School Enrollment Management</td>
<td>Before the end of first year of doctoral coursework</td>
</tr>
<tr>
<td>5 File changes in degree program, if necessary</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Graduate School Enrollment Management</td>
<td>As needed</td>
</tr>
<tr>
<td>6 Take Qualifying Examination for major and minor subjects.</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>See step #7</td>
<td>After approval of doctoral program and completion of coursework</td>
</tr>
<tr>
<td>7 Recommendation for admission to candidacy (request by memo)</td>
<td>Chair of Committee</td>
<td>Graduate School Enrollment Management</td>
<td>After passing qualifying exam and no later than 4 months before graduation</td>
</tr>
<tr>
<td>8 Enroll in semester of graduation if all requirements are met (at least 3 hours)</td>
<td>Graduate Advisor or Chair, Advisory Committee</td>
<td>Registrar</td>
<td>Semester of graduation</td>
</tr>
<tr>
<td>9 File &quot;STATEMENT OF INTENTION TO GRADUATE&quot; form with official title of dissertation listed</td>
<td>Student</td>
<td>Graduate School Enrollment Management</td>
<td>Semester of graduation (One must be filed for each intended graduation semester.)</td>
</tr>
<tr>
<td>10 Pay the Thesis-Dissertation fee through Student Business Services</td>
<td>Graduate School Dissertation Supervisor</td>
<td>Student Business Services</td>
<td>Semester of graduation (This is paid only once.)</td>
</tr>
<tr>
<td>11 Schedule final oral defense of dissertation and submit DEFENSE NOTIFICATION FORM at least 3 weeks before defense</td>
<td>Student, Committee Chair, and Advisory Committee</td>
<td>Graduate School Dissertation Supervisor</td>
<td>At least 3 weeks before defense</td>
</tr>
<tr>
<td>12 Stand for final oral defense of dissertation</td>
<td>Advisory Committee</td>
<td>Graduate School Doctoral Coordinator</td>
<td>Semester of graduation</td>
</tr>
<tr>
<td>13 Submit signed ORAL DEFENSE and THESIS-DISSERTATION APPROVAL FORM and, after incorporating committee changes, submit .pdf file of dissertation to ETD site for review</td>
<td>Student, Advisory Committee</td>
<td>Graduate School Dissertation Supervisor</td>
<td>Semester of graduation (usually 5 weeks before graduation date)</td>
</tr>
<tr>
<td>14 Final grade for dissertation hours (A or B)</td>
<td>Committee Chair or Advisory Committee</td>
<td>Registrar-Final Grade Roll</td>
<td>End of semester</td>
</tr>
<tr>
<td>15 Submit final .pdf of dissertation to ETD web site (DMA students submit PDF programs to ETD site and turn CDs in to the Graduate School)</td>
<td>Student</td>
<td>Graduate School Dissertation Supervisor</td>
<td>Prior to deadline</td>
</tr>
<tr>
<td>16 Complete Doctoral Survey</td>
<td>Student</td>
<td><a href="http://survey.ncc.uchicago.edu/doctorate">http://survey.ncc.uchicag o.edu/doctorate</a></td>
<td>Before graduation</td>
</tr>
</tbody>
</table>

Revised 02/22/2012
APPENDIX F

Graduate Student Association(s)

Geosciences Society

Geoscience Society is an academic organization focused on providing geoscience students the opportunity to interact with other students who share the same interest. This organization is open to any person who has an interest in geosciences, atmospheric sciences and geography and consists of both undergraduate and graduate students. We have numerous social and volunteer events throughout the year including tailgates, holiday parties, restaurant fundraisers, the Lubbock Pancake Festival, Ronald McDonald House and science days at the Texas Tech University Museum. Joining the club as an undergraduate is a great way to meet graduate students and interact with faculty in an informal setting. When it comes time to work on your senior research, the club will provide funding to any student who requests it. You may receive up to $300 provided you are a paying member, $15/year or $10/semester, and have four hours of community service for the year. This funding may go towards field research, lab work, or travel to academic conferences. We provide an additional $50 to students for graduate school applications. To learn more about our organization, please visit our facebook page at Texas Tech Geoscience Students.

American Association of Petroleum Geologists-AAPG

The AAPG chapter at TTU is a student run professional organization focused on providing guidance and opportunities for personal development and career placement in the oil and gas industry. This is accomplished by providing a community of people interested in the oil and gas industry, trips to AAPG scientific meetings and recruiting events, networking with oil and gas companies that come to TTU to recruit, and various events from science based field trips to social events like tailgating. The AAPG student chapter is also dedicated to participating in community service events such as the Lions’ Pancake Festival and adopt-a-highway cleanup. The AAPG student chapter also endorses and provides support for events, with cooperation of the Geoscience Society, that encourage a sense of community within the Geoscience Department from undergraduates to faculty, such as tailgates, BBQ/picnics, and most importantly the AAPG Chili Cook-off. Being a member of the AAPG student chapter is an important first-step in attaining an internship/career in the oil and gas industry. To join the AAPG student chapter you only have to be a member of AAPG, which is free for students supported by Chevron.
Geoscience Leadership Organization for Women (GLOW)

Geoscience Leadership Organization for Women or GLOW is a new academic organization focused on promoting the involvement of women in the geosciences. This organization is open to any person who has an interest in geology, geophysics, atmospheric sciences, and geography and consists of both undergraduate and graduate students. We plan on having numerous volunteer and social events throughout the year that increase the exposure of STEM fields to young girls and encourage an open dialogue among students and faculty that focuses on women in the geosciences. Joining the club, as an undergraduate, is a great way to meet graduate students and interact with faculty in an informal setting, participate in career-focused lectures given by prominent scientists in the field, and become involved in the local community. Membership is $15/year or $10/semester.

American Meteorological Society Student Chapter -AMS

The Texas Tech Student Chapter of the American Meteorological Society is a society open to weather enthusiasts of all majors and backgrounds. Meeting monthly during the school year, our organization is active in the community as well as on campus. Our main mission is to promote science education in the fields of meteorology, atmospheric science, wind engineering, and other related science and engineering fields. In addition to this, we also actively promote severe weather preparedness for members of the surrounding community. Our biggest event of the year is the annual Severe Weather Awareness Day. Requiring months of planning and preparing, this event is made possible through partnerships with government agencies such as the Lubbock National Weather Service forecast office and private groups like the Science Spectrum, the American Red Cross, and local media outlets. Free to the public, this event attracts hundreds from the surrounding area, and offers both weather education exhibits and severe weather preparedness information. Our members consistently help to inform the public of ways to protect both life and property in the event of severe weather, as well as how the weather works and is forecast. In addition to Severe Weather Awareness Day, members engage in fundraising activities to allow our society to have social events, invite speakers from other institutions and private industry, and offer assistantships to members to attend the National AMS Annual Meeting. Undergraduate members are eligible to apply for funding to attend the Student Conference in an effort to help these promising young scientists to experience a true scientific conference, visit with potential graduate schools and employers, and interact with their peers from other institutions. In addition, graduate students are eligible to apply for funding to assist with costs associated with presenting original research material during the Professional Conference.
**Gamma Theta Upsilon**

Gamma Theta Upsilon (ΓΘΥ - GTU) is the international honor society for geography. Gamma Theta Upsilon was founded in 1928 and became a national organization in 1931. Texas Tech has been home to the Kappa Chi chapter for over 50 years, and continues a tradition of geographic excellence. Members of GTU have met strict academic requirements and share a background and interest in geography. GTU chapter activities support geography knowledge and awareness. Members are expected to uphold the highest levels of ethical and academic integrity. As leaders, they represent the future of the field of Geography. Undergraduate and graduate students with at least a 3.30 GPA (overall and in Geography) are eligible for nomination to membership. The induction ceremony is held every Spring. GTU members have access to a variety of scholarships, research funds, and publication opportunities. GIST students may also be eligible for membership.
APPENDIX G

GRADUATE FACULTY 6-YEAR RESUMES

Brian Ancell
Texas Tech University
(806) 742-3143
brian.ancell@ttu.edu

Education and Post Graduate Training

Ph D, University of Washington, 2006.
   Major: Atmospheric Sciences
   Supporting Areas of Emphasis: Predictability, Data Assimilation, Sensitivity Analysis
   Dissertation Title: The Nature of Adjoint Sensitivities with Respect to Model Parameters and
   Their Use in Adaptive Data Assimilation

BS, University of Illinois, 1998.
   Major: Civil Engineering

Academic and Professional Experience

Assistant Professor, Texas Tech University. (January 12, 2010 - Present).

Postdoctoral Research Assistant, University of Washington Department of Atmospheric
Sciences. (October 12, 2006 - December 4, 2009).

TEACHING

Courses Taught

Texas Tech University
   ATMO 1100, Atmospheric Science Laboratory, 42 courses.
   ATMO 1300, Introduction to Atmospheric Science, 6 courses.
   ATMO 3301, General Meteorology, 2 courses.
   ATMO 4300, Independent Studies in Atmospheric Science, 4 courses.
   ATMO 4312, Undergraduate Research, 2 courses.
   ATMO 5101, Atmospheric Science Seminar, 1 course.
   ATMO 5301, Indiv Stds In Atmo: Wind Science, 1 course.
   ATMO 5332, Regional Scale Numerical Weather Prediction, 2 courses.
   ATMO 6000, Master's Thesis, 17 courses.
   ATMO 7000, Research, 21 courses.
   CASC 3300, Introduction to Integrative Research in Arts and Sciences, 1 course.
   CASC 4350, Capstone in Integrative Research in Arts and Sciences, 1 course.
   GEOL 4312, Undergraduate Research, 2 courses.
   GEOL 8000, Doctor's Dissertation, 1 course.
GPH 5324, Radiative Transfer, 2 courses.

Directed Student Learning

Brock Burghardt, Dissertation Committee Chair, "Examination of the Predictability of Severe Convection using Ensemble Sensitivity Analysis," Geosciences. (August 2013 - Present).


Nick Smith, Master's Thesis Committee Chair, "Developing Forecast Sensitivity Climatology for Wind Ramps in West Texas," Geosciences. (August 2012 - Present).

Jennifer Daniel, Master's Thesis Committee Member, Atmospheric Science Group. (April 1, 2011 - Present).

Katherine Horgan, Master's Thesis Committee Member, Atmospheric Science Group. (February 1, 2011 - Present).


Anthony Reinhart, Dissertation Committee Member, "TBD," Geosciences. (February 1, 2010 - Present).

Aaron Hill, Master's Thesis Committee Member, Geosciences. (September 1, 2012 - December 2014).


Patrick Skinner, Dissertation Committee Member, "Observations and Ensemble Kalman Filter Analyses of Multiple Internal Rear-Flank Downdraft Momentum Surges within the 18 May 2010, Dumas, Texas Supercell," Other (Within Texas Tech University). (April 1, 2011 - May 2014).


Christopher Bednarczyk, Master's Thesis Committee Chair, "Integrating Forecast Sensitivity into the NWS Forecasting Process," Atmospheric Science Group. (June 1, 2011 - August 2013).


William Asquith, Dissertation Defense Committee Member, Civil & Environmental Engineering. (February 10, 2011).

Kirsten Orwig, Dissertation Defense Committee Member, "Examining Strong Winds from a Time-Varying Perspective," Other (Within Texas Tech University). (April 1, 2010 - April 30, 2010).

RESEARCH

Published Intellectual Contributions

Abstract


Book, Chapter in Scholarly Book-New


Conference Proceeding


Journal Article, Academic Journal


**Research description on AGU flyer to promote Texas State research to Congress**


**Presentations Given**

Ancell, B. (Presenter & Author), American Geophysical Union Annual Meeting, "The Use of Ensemble-Based Sensitivity with Observations to Improve the Predictability of Severe Convective Events," American Geophysical Union, San Francisco, CA. (December 17, 2014).


Ancell, B. (Presenter & Author), American Meteorological Society Houston Chapter Meeting, "Developing Ensemble-Based Tools to Improve Predictability within the Texas Tech Prediction System," American Meteorological Society Houston Chapter, Houston, TX. (October 10, 2014).


Ancell, B. (Presenter & Author), Texas Tech University Libraries' 28th Annual Faculty Contributions Exhibit (FACE), "CAREER: Quantifying Inadvertent Weather Modification and Education through Museum Programs," Texas Tech University Libraries, Texas Tech University. (October 2012).

Ancell, B. (Presenter & Author), Weiss, C. (Author Only), Texas Tech University Libraries' 28th Annual Faculty Contributions Exhibit (FACE), "Integration of Forecast Sensitivity into the NWS Forecasting Process to Improve Predictability of High-impact Weather," Texas Tech University Libraries, Texas Tech University. (October 2012).


Ancell, B. (Presenter & Author), Texas Tech CS5331 Guest Class Lecture, "The Theory and Practice of Numerical Weather Prediction and Atmospheric Data Assimilation," Professor Yong Chen, Department of Computer Science, Texas Tech University. (March 9, 2012).


Ancell, B. (Presenter & Author), Bednarczyk, C. (Author Only), Dallas/Ft. Worth National Weather Service Severe Weather Seminar, "The TTU Ensemble Prediction System: Research and
Ancell, B. (Presenter & Author), Texas Tech PUAD5348 Class Guest Lecture, "Atmospheric Reanalysis: The Good, the Bad, and the Ugly," Professor Katherine Hayhoe, Department of Political Science, Texas Tech University, Holden Hall. (February 6, 2012).


Ancell, B. (Presenter & Author), Texas Tech University Libraries' 27th Annual Faculty Contributions Exhibit (FACE), "Evaluation of Surface Analyses and Forecasts with a Multiscale Ensemble Kalman Filter in Regions of Complex Terrain," Texas Tech University Libraries, Lubbock, TX. (October 5, 2011).


Ancell, B. (Presenter & Author), Texas A&M University Atmospheric Sciences Tuesday Seminar Series, "Multi-Scale Ensemble Data Assimilation: How Important is Improved Resolution?," Texas A&M University Department of Atmospheric Sciences, College Station, TX. (November 23, 2010).

Ancell, B. (Presenter & Author), Texas Tech University Libraries' 26th Annual Faculty Contributions Exhibit (FACE), "The Sensitivity of Adjoint Sensitivity," Texas Tech University Libraries, Lubbock, TX. (October 2010).

Ancell, B. (Presenter & Author), University Corporation for Atmospheric Research (UCAR) 50th Annual Meeting, "How Will NCAR and Universities Address Future Scientific Questions and Societal Concerns?," UCAR, Boulder, CO. (October 6, 2010).


Media Contributions

Internet

TTU Arts and Sciences website homepage. (September 2012).

Other

TTU Libraries FACE Exhibit Promotional Video. (September 2012).

Contracts, Grants and Sponsored Research

Contract


Grant

Ancell, B. (Co-Principal), Duncan, R. (Principal), Giesselmann, M. (Co-Principal), Bayne, S. (Co-Principal), He, M. (Co-Principal), Hui, Q. (Co-Principal), Smith, P. (Co-Principal), Schroeder, J. (Co-Principal), Hewett, R. (Co-Principal), "Supporting the Global Laboratory for Energy Asset Management & Microgrid (GLEAMM)," Sponsored by Texas Emerging Technology Fund, State, $2,200,000.00. (January 13, 2015 - January 12, 2020).

Smith, P. W. (Co-Principal), Giesselmann, M. (Co-Principal), Hewett, R. (Co-Principal), Bayne, S. (Co-Principal), Schroeder, J. (Co-Principal), Hui, Q. (Co-Principal), Ancell, B. (Co-Principal), He, M. (Co-Principal), Duncan, R. (Principal), "Supporting the Global Laboratory for Energy Asset Management & Microgrid (GLEAMM)," Sponsored by Texas Emerging Technology Fund, State, $215,000.00. (January 13, 2015 - January 12, 2020).

Smith, P. W. (Co-Principal), Giesselmann, M. (Co-Principal), Hewett, R. (Co-Principal), Bayne, S. (Co-Principal), Schroeder, J. (Co-Principal), Hui, Q. (Co-Principal), Ancell, B. (Co-Principal), He, M. (Co-Principal), Duncan, R. (Principal), "Supporting the Global Laboratory for Energy Asset Management & Microgrid (GLEAMM)," Sponsored by Texas Emerging Technology Fund, State, $2,200,000.00. (January 13, 2015 - January 12, 2020).


Ancell, B. (Co-Principal), Weiss, C. C. (Co-Principal), "Integration of Forecast Sensitivity into the NWS Forecasting Process to Improve Predictability of High-impact Weather," Sponsored by


Ancell, B. (Principal), "Comparison of Surface Analysis Techniques toward Operational Use at the National Weather Service," Sponsored by University Corporation for Atmospheric Research (UCAR), Federal, $9,849.00. (June 1, 2012 - May 31, 2013).

Schroeder, J. (Co-Principal), Ancell, B. (Co-Principal), "Weather Forecast Improvement Project," Sponsored by Department of Energy, Federal, $481,637.00. (September 2010 - February 2013).


Ancell, B. (Principal), "Predictability and Weather Regimes Along the West Coast," Sponsored by Naval Research Laboratory, State, $42,712.00. (October 1, 2009 - September 30, 2011).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Research in Progress**

"Convection Initiation" (Planning).

- Studying the dynamics and inherent predictability of convection initiation along Southern Plains drylines.

"Wind Power Prediction" (Planning).

- The goal is to develop forecasting tools for the active and reactive power produced by wind farms. The project is in collaboration with Dr. Vittal Rao (lead) of EE, Dr. Brian Ancell of Atmospheric Sciences, and the South West Research Institute.

"Storm Prediction Center Hazardous Weather Testbed Spring Experiment" (Complete). (June 2014).

- This week-long participation at the Storm Prediction Center was to test new forecasting techniques for severe weather. It is an annual event with participation from a number of research and operational personnel.

"Big Weather Workshop" (Complete). (January 2014).

- This workshop was held to convene a number of researchers from different institutions
toward collaborating on an NSF grant. As a result, a collaborative NSF grant was indeed submitted (see above for details).

SERVICE

Department Service

Faculty Advisor, Texas Tech Student Chapter of the American Meteorological Society. (September 1, 2010 - Present).

Committee Member, Wind Science and Engineering (WISE) Curriculum Committee. (September 2010 - June 2013).

Committee Member, Geospatial Technology Faculty Position Search Committee. (September 1, 2012 - February 2013).


Committee Member, Department of Geosciences Faculty Search Committee. (November 2010 - February 2011).

Committee Member, ATMO Faculty Search Committee #1. (February 2010 - April 2010).

Committee Member, ATMO Faculty Search Committee #2. (February 2010 - April 2010).

Professional Service

Editor, Associate Editor, American Meteorological Society (AMS) Journal of Applied Meteorology and Climatology, Boston, MA. (January 1, 2014 - Present).


Program Coordinator, American Geophysical Union (AGU), San Francisco, CA. (April 2014 - December 2014).


Editor, Associate Editor, American Meteorological Society (AMS) Weather and Forecasting Journal, Boston, MA. (January 1, 2010 - December 31, 2014).

Program Coordinator, American Geophysical Union (AGU), San Francisco, CA. (April 2013 - December 2013).

Program Coordinator, American Geophysical Union (AGU), San Francisco, CA. (April 2012 - December 2012).

Reviewer, Grant Proposal, National Science Foundation (NSF), Lubbock, TX. (February 2012).

Program Organizer, American Geophysical Union (AGU), San Francisco, CA. (April 2011 - December 10, 2011).

Judge for Outstanding Student Paper Award (OSPA), American Geophysical Union, San Francisco, CA. (December 5, 2011 - December 8, 2011).


Program Organizer, American Geophysical Union (AGU), San Francisco, CA. (April 2010 - December 17, 2010).

Attendee, Meeting, University Corporation for Atmospheric Research (UCAR), Boulder, CO. (October 4, 2010 - October 6, 2010).

GENERAL

Licensures and Certifications

Ensemble Prediction System License, Texas Tech University. (September 2013 - Present).

Consulting


Professional Memberships

NA, American Geophysical Union. (October 1, 2010 - Present).

NA, American Meteorological Society. (December 1, 2004 - Present).

Development Activities Attended

Workshop, "NSF Fastlane Workshop," Texas Tech Office of Research Services, Lubbock, TX, USA. (February 10, 2011).

Workshop, "NSF CAREER Proposal Writing Workshop," Texas Tech Office of Research Services, Lubbock, TX, USA. (April 9, 2010).
Dr. George B. Asquith
Texas Tech University
(806) 742-3154
GEORGE.ASQUITH@ttu.edu

Education and Post Graduate Training

Ph D, University of Wisconsin, 1966.
Major: GEOLOGY
Supporting Areas of Emphasis: GEOPHYSICS
Dissertation Title: The Marine Dolomitization of the Mifflin Member of the Platteville Limestone in SW Wisconsin

MS, University of Wisconsin, 1963.
Major: GEOLOGY
Dissertation Title: Origin of the Pre-Cambrian Wisconsin Rhyolites

BS, Texas Tech University, 1961.
Major: GEOLOGY
Supporting Areas of Emphasis: MATH

Academic and Professional Experience

PROFESSOR, TEXAS TECH UNIVERSITY. (June 2, 2006 - Present).
Starting in 2006 I have a 1/4 time appointment in the Department of Geosciences teaching the following courses:
- Petrophysics
- Advanced Petrophysics

Leadership Awards and Honors

TEACHING

Courses Taught

Texas Tech University
4300, PETROPHYSICS GEOL 4300, 1 course.
4312, ADVANCED PETROPHYSICS [GEOL 4312], 1 course.
5325, PETROPHYSICS [GEOL 5325], 1 course.
5399, ADVANCED PETROPHYSICS [GEOL 5399], 1 course.
GEOL 4300, Independent Studies-Geol: Petrophysics, 12 courses.
GEOL 4312, Undergraduate Research, 4 courses.
GEOL 5001, Problems in Geosciences, 1 course.
GEOL 5300, Individual Studies in Geology, 1 course.
GEOL 5325, Petrophysics, 5 courses.
GEOL 5399, Advanced Petrophysics, 6 courses.
GEOL 6000, Master's Thesis, 1 course.
GEOL 7000, Research, 2 courses.
GEOL 8000, Doctor's Dissertation, 4 courses.
Directed Student Learning


Charlie Keracik, Master's Thesis Committee Member, "EXPERIMENTAL STUDY OF THE PYROLYSIS OF EAGLE FORD OIL SHALE," Geosciences. (September 1, 2014 - Present).


KAITLYN ANDREAS, Master's Thesis Committee Member, "UNDERSTANDING NATURALLY FRACTURED RESERVOIR MECHANICS BY STUDYING THE GEOMETRICS AND KINEMATICS OF GYPSUM-FILLED FRACTURES IN THE PERMIAN STRATA OF CAPROCK STATE PARK, TEXAS USA," Geosciences. (September 1, 2013 - Present).

Zachary Wilson, Master's Thesis Committee Member, "CHARACTERIZATION OF GEOTHERMAL ANOMALIES IN THE LOUISIANA CONTINENTAL SHELF, GULF OF MEXICO USING CORRECTED BOTTOM HOLE TEMPERATURES," Geosciences. (September 1, 2013 - Present).

Kenny Rogers, Master's Thesis Committee Member, "Investigation of the lithosphere surrounding the southern Emperor chain using PP precursors," Geosciences. (September 1, 2010 - Present).

TOM HARRINGTON, Master's Thesis Committee Member, "Investigation of post Ouachita orogen tectonic activity in the Texas Gulf Coast," Geosciences. (September 1, 2010 - Present).

STEVEN MANNING, Master's Thesis Committee Member, "SUBSIDENCE HISTORY and ANALYSIS for WEST TEXAS MATADOR ARCH," Geosciences. (September 2, 2009 - Present).

Olabisi Ajiboye, Master's Thesis Committee Member, "Thermal Mechanisms in the Wilcox Corsair Fault Zone of the Texas Gulf Coast and Continental Shelf, Gulf of Mexico," Geosciences. (September 1, 2009 - Present).

Nosa Ogiamien, Master's Thesis Committee Member, "Heat and Fluid Transport in the Vicinity of the Corsair Growth Fault Zone, Texas Continental Shelf, Gulf of Mexico," Geosciences. (September 1, 2008 - Present).

ALEC DOTZER, Master's Thesis Committee Member, "MANTLE TRANSITION ZONE VARIATIONS ACROSS CENTRAL SOUTH AMERICA," Geosciences. (September 1, 2012 - October 15, 2015).

Kaitlyn Andreas, Master's Thesis Committee Member, "Understanding naturally fractured reservoir mechanics by studying the geometry and kinematics of gypsum-filled fractures in the permian strata of Caprock Canyons State Park, Texas, USA," Geosciences. (September 1, 2012 - May 19, 2015).


Mehdi Rafiee, Dissertation Defense Committee Member, "Geomechanical Considerations in Hydraulic Fracturing Design," Petroleum Engineering. (September 1, 2010 - February 27, 2014).

Ann Proske, Dissertation Committee Member, "Conodont biostratigraphy of Lower Mississippian strata, San Andres Mountains, New Mexico," Geosciences. (September 1, 2009 - August 22, 2013).

Olusola Oluwole, Master's Thesis Committee Member, "Investigation of recent tectonic activity on the Matador Arch in the southern High Plains," Geosciences. (September 1, 2010 - April 26, 2013).


Mathew Tave, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - March 25, 2013).

Thomas Herrington, Master's Thesis Committee Member, "Determining crustal thickness and velocity variations, east Texas/Gulf of Mexico using Pn tomography and reciever functions comparisons," Geosciences. (September 1, 2011 - March 25, 2013).


Lauren Pate, Master's Thesis Committee Member, "Textural Analysis of FMI Logs to Determine Lithofacies in Early Permian Paddock Member," Geosciences. (September 12, 2009 - August 15, 2012).

Lauren Pate, Master's Thesis Committee Member, "Textural Analysis of FMI Logs to Determine Lithofacies Early Permian Paddock Member," Geosciences. (September 12, 2009 - August 15, 2012).

Mathew Oyedji, Master's Thesis Committee Member, "Lithofacies Analysis and Sequence Stratigraphy of the Fredricksburg Group (Cretaceous) in the Callahan Divide Region of West-Central Texas," Geosciences. (September 1, 2009 - August 1, 2011).


Graham Butler, Master's Thesis Committee Member, "High Frequency Sequence Startigraphy and Controls on Strata Architecture of an upper Pennsylvanian Limestone: Bethany Falls Limestone Mid-Continent USA," Geosciences. (September 2008 - October 18, 2010).

Md Rakibul Sarker, Dissertation Committee Member, Petroleum Engineering. (September 2007 - May 2010).

Teaching Awards and Honors

Student Nominations as a "Most Influential Professor", Dept of Petroleum Engineering. (May 16, 2014).

GEORGE B. ASQUITH SCHOLARSHIP for EXCELLENCE in PETROLEUM GEOLOGY, Mr. Eddie David through AAPG. (October 21, 2009).

RESEARCH

Published Intellectual Contributions

Book, Textbook-New


Conference Proceeding


Journal Article, Professional Journal


Presentations Given


Asquith, G., SOUTHWEST AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS MEETING, "OOIPstb USING TRIPLE COMBO DATA, TRIPLE COMBO PLUS GEOCHEM DATA, AND PYROLYSIS S1 DATA PERMIAN WOLFCAMP MIDLAND BASIN TEXAS," SOUTHWEST AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, MIDLAND. (May 27, 2014).


Asquith, G., WTGS 2012 Fall Symposium, "Determination of Sw using (m) and (n) values Derived from Log Data and the Maxwell-Garnett Equation: Permian Clear Fork Vuggy Dolostone West Texas," West Texas Geological Society, Midland Texas. (September 26, 2012).


Asquith, G. (Presenter & Author), WTGS 2010 Fall Symposium, "A New Method for Determining Volume of Clay (Vcl) and Effective Porosity (PHie) using Simultaneous Equations with Bulk Density and Neutron Porosity Data," West Texas Geological Society, Midland, Texas. (September 21, 2010).


Research in Progress

"EFFECTIVE POROSITY and VOLUME of CLAY DETERMINATION" (On-Going).
Using only bulk density and neutron porosity logs together with simultaneous equations I am trying to develop a better method to determine effective porosity and volume of clay from well logs. Effective porosity and volume of clay are used in the analysis of shaly sandstones.

"PETROPHYSICS of GAS-BEARING SHALES" (On-Going).
The important gas exploration going today involves the gas-bearing shale reservoirs. I am working on methods to do log analysis using standard well logging suites. Using these method log analysis will be possible on standard logging suites back to 1979.

Research Interests

true, Petrophysics Carbonate, Sandstones, and Shale Reservoirs

SERVICE

Service Awards and Honors
Service, Professional


Honorary Life Member, Permian Basin Section SEPM. (October 17, 2009).

GENERAL

Licensures and Certifications

DPA Member (CPG #3060), Am. Asoc. of Petroleum Geologists Division of Professional Affairs. (June 30, 1986 - Present).

Consulting

Government, ILLINOIS GEOLOGICAL SURVEY, URBANA, ILLINOIS. (June 2, 2008 - Present).

Non-Governmental Organization (NGO), PETROLEUM PROFESSIONAL DEVELOPMENT CENTER, Midland, Texas. (December 18, 1995 - Present).

Non-Governmental Organization (NGO), AM. ASSOC. of PETROLEUM GEOLOGISTS, NUMEROUS LOCATIONS. (1984 - Present).

Professional Memberships


Member, Soc. of Petroleum Engineers. (February 11, 1994 - Present).

Member, West Texas Geological Society. (August 30, 1988 - Present).

Member, Soc. of Professional Well Log Analysts. (April 15, 1980 - Present).


none, SIGMA Xi. (1966 - Present).

Permian Basin Section Soc. of Economic Paleontologists and Mineralogists. (June 1988 - 2010).
Education and Post Graduate Training

Ph D, Texas Tech University, 2011.
Major: Civil Engineering

Ph D, University of Texas at Austin, 2003.
Major: Geosciences

MS, University of Texas at Austin, 1994.
Major: Civil Engineering

BS, University of Texas at Austin, 1992.
Major: Civil Engineering

TEACHING

Courses Taught

Texas Tech University
GEOL 4312, Undergraduate Research, 2 courses.

RESEARCH

Published Intellectual Contributions

Conference Proceeding

Cleveland, T., Asquith, W., Rainwater, J. K. (2013). Modeling White River, Texas and Tierra Blanca Creek, Texas | Case Studies using iRIC/SToRM. Austin, Texas: Texas Section, American Society of Civil Engineers.

Presentations Given

Rainwater, K., Song, L., Cleveland, T., Schroeder, J., Fish, E., McLendon, T., Zartman, R., Arsuffi, T., Asquith, W., Presentation to Speaker of the Texas House of Representatives Joe Straus and 84th District Representative John Frullo, "Selected Recent Texas Water Research Interests and Capabilities," Office of the President of Texas Tech University, Lubbock, TX. (September 29, 2014).

GENERAL

Licenses and Certifications

Professor Calvin G. Barnes  
Texas Tech University  
(806) 834-7389  
CAL.BARNES@ttu.edu

Education and Post Graduate Training

Ph D, University of Oregon, 1982.  
Major: Geology

MS, University of Oregon, 1978.  
Major: Geology

BS, University of Nebraska, 1975.  
Major: Geology  
Supporting Areas of Emphasis: Math/Physics

Academic and Professional Experience

Professor, Texas Tech University. (August 8, 1982 - Present).  
Assistant Professor 1982-1988  
Associate Professor 1988-1994  
Full Professor 1994-present  
Chair 2007-present

TEACHING

Courses Taught

Texas Tech University

Masters thesis, 1 course.  
5305, Trace element geochemistry, 1 course.  
7000, Research, 1 course.  
8000, Dissertation, 1 course.  
GCH 5303, Trace Element Geochemistry, 3 courses.  
GEOL 1101, Physical Geology Laboratory, 8 courses.  
GEOL 1303, Physical Geology: Majors Only, 1 course.  
GEOL 4300, Independent Studies in Geology, 1 course.  
GEOL 4312, Undergraduate Research, 5 courses.  
GEOL 4321, Igneous and Metamorphic Petrography, 17 courses.  
GEOL 5001, Problems in Geosciences, 1 course.  
GEOL 5300, Indiv Stds In Geology: Igneous and Metamorphic Petrography, 6 courses.  
GEOL 5303, Advanced Igneous Petrology, 3 courses.  
GEOL 6000, Master's Thesis, 20 courses.  
GEOL 7000, Research, 20 courses.  
GEOL 8000, Doctor's Dissertation, 10 courses.

Directed Student Learning

Kevin Werts, Dissertation Defense Committee Chair, "TBA," Geosciences. (January 2015 - Present).
Annie Aaroe, Master's Thesis Committee Member, Geosciences. (September 2014 - Present).


Heipeng Tian, Master's Thesis Committee Chair, "TBA," Geosciences. (January 2014 - Present).


Jeremy Deans, Dissertation Committee Member, "TBA," Geosciences. (September 1, 2010 - Present).

Samantha Buck, Master's Thesis Committee Chair, "Magma mixing in the interior zone of the Wooley Creek batholith, California," Geosciences. (August 15, 2010 - Present).


Rachel Weiss, Master's Thesis Committee Chair, "Geochemistry of augite in late Middle Jurassic arc plutons, Klamath Mountains, Oregon," Geosciences. (August 2012 - December 2014).

Jacob Leader, Master's Thesis Committee Member, "Preferred orientation of opaque phases in deformed oceanic crust," Geosciences. (August 2010 - May 2014).


Jeffrey Oalmann, Master's Thesis Committee Chair, "Geology and petrology of the island of Ylvingen, Helgeland Nappe Complex, Norway," Geosciences. (2010).


RESEARCH

Published Intellectual Contributions

Abstract


Book, Chapter in Scholarly Book-New

**Book, Chapter in Scholarly Book-Revised**


**Conference Proceeding**


**Journal Article, Academic Journal**


**Journal Article, Professional Journal**


**Journal, Edited Issue**

Barnes, C. G., Coint, N., Yoshinobu, A. Crystal accumulation in a tilted arc batholith. *American Mineralogist.*

**field guide for international field conference**

Presentations Given


Barnes, C. G. (Presenter & Author), Barnes, M. (Presenter & Author), Graduate Short Course, "In situ laser methods in modern lithological research," Univ. of Helsinki Dept. of Geology, Helsinki, Finland. (September 2014).

Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Barnes, M. (Author Only), Cottle, J. (Author Only), Ramo, O. T. (Author Only), Goldschmidt Conference, "Magma differentiation in a 40km thick accretionary complex, Klamath Mountains, CA, USA," Geochemical Society, Sacramento, CA. (June 2014).


Olinger, D. (Presenter & Author), Barnes, M. (Author Only), Barnes, C. G. (Author Only), Kargi, H. (Author Only), South-Central meeting, Geological Society of America, "Deciphering the tectonic setting of the Pecos Mafic Intrusive Complex using trace element concentrations in orthopyroxene," Geological Society of America, Austin, TX. (2013).


Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Buck, S. A. (Author Only), Rämö, T. (Author Only), Barnes, M. (Author Only), South-Central section, Geological Society of America, "Xenoliths, enclaves, and synplutonic dikes in the Wooley Creek batholith, northern California," Geological Society of America, Austin, TX. (2013).


Rämö, O. T. (Presenter & Author), Barnes, M. (Author Only), Larjamo, K. (Author Only), Lahaye, Y. (Author Only), Michallik, R., Barnes, C. G. (Author Only), Heinonen, A. (Author Only), AGU 2012 Fall Meeting, "Major and trace element and lead isotope composition of rapakivi

Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Barnes, M. A. (Author Only), Yoshinobu, A. S. (Author Only), American Geophysical Union Fall Meeting, "Development of a large volume of eruptible mush in the upper Wooley Creek batholith, Klamath Mountains, California: evidence from bulk rock, mineral analyses and textural observations," American Geophysical Union, San Francisco, CA. (December 2012).


Yoshinobu, A. (Presenter & Author), Coint, N. (Author Only), Barnes, C. G. (Author Only), Chamberlain, K. (Author Only), (Author Only), Yoshinobu, A., Tore, P. (Author Only), Prodoc 4-D Adamello Conference, Bagolino, Italy, "How big is a batholithic magma chamber?", Swiss National Science Foundation, Bagolino, Italy. (September 2012).

Barnes, C. G., Fifth Geocheistry Symposium, "Using mineral compositions and zoning to understand the growth of a mid-crustal pluton, Klamath Mountains, California, USA," Denizli, Turkey. (May 23, 2012).


Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Rämö, O. T. (Author Only), Barnes, M. (Author Only), Fall Meeting, American Geophysical Union, "Sources and fate of xenoliths in the Wooley Creek batholith—a geochemical perspective," American Geophysical Union, San Francisco, CA. (December 2011).


Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Barnes, M. A. (Author Only), Yoshinobu, A. (Author Only), Fall Meeting, American Geophysical Union, "Using mineral trace element geochemistry to track magma processes in a "big tank" magma chamber: a laser ablation ICP-MS study of hornblende and augite," American Geophysical Union, San Francisco, CA. (December 2011).


Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Allen, C. M. (Author Only), Geological Society of America Cordilleran Section meeting, "Late Middle Jurassic 'retro-arc' magmatism in the Klamath Mountain province," Geological Society of America, Anaheim, CA. (2010).

Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Geological Society of America Cordilleran Section meeting, "Multiple magma batches in the tilted Wooley Creek batholith, Klamath Mountains, California," Geological Society of America, Anaheim, CA. (2010).


Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Geological Society of America Annual Meeting, "Comparison between roof dikes and equivalent intrusive rocks from the Wooley Creek batholith and the Slinkard pluton, Klamath Mountains, California: a laser ablation ICP-MS study of augite," GSA, Portland, OR. (2009).


Contracts, Grants and Sponsored Research

Grant

Barnes, C. G. (Principal), Hetherington, C. (Co-Principal), Yoshinobu, A. (Co-Principal), Sylvester, P. (Co-Principal), "Subcretion versus relamination: testing processes of lower crustal modification in the Klamath Mountain accretionary province," Sponsored by NSF, Texas Tech University, $350,001.00. (June 1, 2016 - May 31, 2019).


Intellectual Contributions in Submission

Journal Article, Professional Journal

Romanoski, A., Coint, N., Hetherington, C., Cottle, J. M., Barnes, C. G. The Impact of Chemical Abrasion on Trace Element, U-Pb, and Oxygen Isotope Analysis of Zircon by In Situ Micro-Analytical Techniques. Chemical Geology.

Research in Progress

"Constraining the timing and rates of magma production in the Ruby Mountain - East Humboldt Range Metamorphic Core Complex" (On-Going).

"Linking intrusive and extrusive magmatism in the Rouge and Chetco Complexes, Klamath Mountains” (On-Going).

"Magma emplacement tectonics" (On-Going).

Research Interests

true, igneous petrology and petrologic processes. Relationships between petrologic processes and tectonics.

SERVICE

University Service

Committee Member, Core Curriculum Natural Science subcommittee. (2008 - Present).

College Service
Committee Member, Bachelor of Science Requirements for A&S Committee. (January 2015 - Present).

Committee Member, Arts & Sciences Research Council. (September 2010 - Present).

Committee Member, Comprehensive Performance Evaluation. (September 1998 - Present).

**Department Service**

Committee Member, Undergraduate Committee. (September 2014 - Present).

Committee Chair, Pevehouse Search Committee. (September 2012 - April 2014).

Recruitment Activity. (September 2000 - December 2012).

**Professional Service**

Editor, Associate Editor, Mineralogical Society of America, Washington, DC. (November 2014 - Present).

Past Chair of Mineralogy, Geochemistry, Petrology, Volcanology Division, Geological Society of America. (November 2013 - October 2014).

Chair of Mineralogy, Geochemistry, Petrology, Volcanology Division, Geological Society of America. (November 2012 - November 2013).


First Vice-Chair, Geological Society of America. (October 2011 - November 2012).

Chair of Cordilleran Section, Cordilleran Section, Geological Society of America. (May 2011 - March 2012).

second Vice-Chair, Geological Society of America: Mineralogy, Geochemistry, Petrology, Volcanology Division. (November 2010 - October 2011).

First Vice-Chairman, Geological Society of America--Cordilleran Section. (May 2010 - May 2011).

**Service/Performance Partnerships**

Outreach for Lubbock AAUW Mother-Daughter program, Engaged Instruction: Public Events and Understanding, Engaged Research and Creative Activity, Sixth grade girls, together with their mothers, participate in science (geosciences, chemistry, and physics) activities designed to introduce the participants to the academic disciplines and related careers. The event is sponsored by the Lubbock chapter of the American Association of University Women, in partnership with TTU and targets Lubbock area girls from disadvantaged backgrounds. The activity includes a tour of the WISE dorms and discussion of opportunities in higher education., Texas. (January 22, 2011 - January 2015).

**GENERAL**

**Professional Memberships**

American Association of University Professors. (1996 - Present).


American Geophysical Union. (1981 - Present).

Geological Society of America. (September 1975 - Present).

Mineralogical Society of America. (1975 - Present).

Development Activities Attended


Dr. Melanie A. Barnes
Texas Tech University
(806) 928-1098
MELANIE.BARNES@ttu.edu

Education and Post Graduate Training

Ph D, Texas Tech University, 2001.
   Major: Geology

MS, University of Oregon, 1981.
   Major: Geology
   Dissertation Title: Cascade Head, an Eocene Volcanic Center

BA, Mount Holyoke College, 1976.
   Major: Chemistry and Geology

Academic and Professional Experience

Graduate Faculty, Texas Tech University. (2007 - Present).

Senior Research Associate, Texas Tech University. (2004 - Present).

TEACHING

Non-Credit Instruction

Workshop, West Texas Association of Women in Science, 23 participants. (November 18, 2011).

Workshop, West Texas Association of Women in Science, 12 participants. (October 21, 2011).

Guest Lecture, Osher Life Long Learning Institute, 35 participants. (September 13, 2011).

Directed Student Learning


Jacob Cobb, Undergraduate Research, Geosciences. (2014).

Lila Roha, Dissertation Committee Member, "comparison of PIXE and ICP dust analysis," Other (Outside Texas Tech University). (2006 - July 2010).

Jeff Ohlman, Master's Thesis Committee Member, Geosciences. (2006 - May 2010).

Lance Sullivan, Master's Thesis Committee Member, Biological Sciences. (November 2006 - 2009).

RESEARCH
Published Intellectual Contributions

Abstract


Journal Article, Academic Journal


Journal Article, Professional Journal


Presentations Given


Barnes, C. G. (Presenter & Author), Barnes, M. (Presenter & Author). Graduate Short Course, "In situ laser methods in modern lithological research," Univ. of Helsinki Dept. of Geology, Helsinki, Finland. (September 2014).

Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Barnes, M. (Author Only), Cottle, J. (Author Only), Ramo, O. T. (Author Only), Goldschmidt Conference, "Magma differentiation in a 40km thick accretionary complex, Klamath Mountains, CA, USA," Geochemical Society, Sacramento, CA. (June 2014).


Olinger, D. (Presenter & Author), Barnes, M. (Author Only), Barnes, C. G. (Author Only), Kargi, H. (Author Only), South-Central meeting, Geological Society of America, "Deciphering the tectonic setting of the Pecos Mafic Intrusive Complex using trace element concentrations in orthopyroxene," Geological Society of America, Austin, TX. (2013).

Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Buck, S. A. (Author Only), Rämö, T. (Author Only), Barnes, M. (Author Only), South-Central section, Geological Society of America, "Xenoliths, enclaves, and synplutonic dikes in the Wooley Creek batholith, northern California," Geological Society of America, Austin, TX. (2013).

David, K. (Presenter & Author), Vercellino, A. (Author Only), Morse, A. (Author Only), Barnes, M. (Author Only), Kohl, K. (Author Only), Annual Meeting, "Chemical Legacy from US Military


Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Barnes, M. (Author Only), Yoshinobu, A. (Author Only), AGU 2012 Fall Meeting, "Development of a large volume of eruptible mush in the upper Wooley Creek batholith, Klamath Mountains, California: evidence from bulk rock, mineral analyses and textural observations.," American Geophysical Meeting, San Francisco CA. (December 2012).


Barnes, C. G. (Presenter & Author), Coint, N. (Author Only), Rämö, O. T. (Author Only), Barnes, M. (Author Only), Fall Meeting, American Geophysical Union, "Sources and fate of xenoliths in the Wooley Creek batholith—a geochmical perspective," American Geophysical Union, San Francisco, CA. (December 2011).

Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Barnes, M. (Author Only), Yoshinobu, A. (Author Only), Fall Meeting, American Geophysical Union, "Using mineral trace element geochemistry to track magma processes in a "big tank" magma chamber: a laser ablation ICP-MS study of hornblende and augite," American Geophysical Union, San Francisco, CA. (December 2011).


**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**

Tatro, D.P., Arimoto, R., McMillan, N.J., LaMont, S.P., Steiner, R.E., Barnes, M. Characterization of 239,240 Pu radionuclide sorption to soil particles and mineral dust aerosols.

Adair, B.M., McBride, T.J., Hooper, M.J., Barnes, M., Allen, C., Craig, K., Diamond, S.L. Metal exposure and accumulation in starlings inhabiting the Anaconda smelter site Deer Lodge County, MT..

**Research in Progress**

"Algae in Playa Lakes - USDOI/USGS/Fish and Wildlife Unit (Patino)".

"Biochemistry of plants (Pare)".

"Cr contamination - contract (Portnoy Environmental)".

"Metal uptake in plants - EPA (Cobb)".

"Metals in vole livers - Chernobyl Project (Baker)".
Research Interests

true, Geochemistry, Geology, Geoscience, Petrology, Environmental Effects, Spectroscopy, Laboratory Practice or Procedure, Research Methodology, Science and Society

SERVICE

University Service

Committee Member, Institutional laboratory Safety Committee. (2011 - 2013).

Department Service


Public Service

Member, Llano Estacado Regional Water Planning Group (Region O), Texas. (2005 - Present).

Board Member, City of Lubbock, Lubbock, Tx. (1984 - Present).

member ('86-88, '01-02); Program VP ('88-'89); Pres-elect ('92-'93); Pres ('93-'94), League of Women Voters of Lubbock Board, Lubbock, Texas. (1984 - Present).

Service/Performance Partnerships

Outreach for Lubbock AAUW Mother-Daughter program, Engaged Instruction: Public Events and Understanding, Engaged Research and Creative Activity, Sixth grade girls, together with their mothers, participate in science (geosciences, chemistry, and physics) activities designed to introduce the participants to the academic disciplines and related careers. The event is sponsored by the Lubbock chapter of the American Association of University Women, in partnership with TTU and targets Lubbock area girls from disadvantaged backgrounds. The activity includes a tour of the WISE dorms and discussion of opportunities in higher education., Texas. (January 22, 2011 - January 2015).

GENERAL

Consulting

For Profit Organization, Whiting Petroleum Corporation, TTU. (July 29, 2014).

Professional Memberships

Member, American Chemical Society.

American Geophysical Union.

Member, Association of Women Geologists.

Chair of Geology and Public Policy Committee, Geological Society of America.
National Association of Geology Teachers.

m, Soil Conservation Society.


Sigma Xi. (May 1976 - Present).

**Development Activities Attended**

Tutorial, "How to be a more effective Chemical Hygiene Officer," Laboratory safety Institute, Lubbock, Tx, USA. (July 14, 2015).


James E. Barrick  
Texas Tech University  
(806) 742-3107  
JIM.BARRICK@ttu.edu

Education and Post Graduate Training

Postdoctoral, Philipps Universitat, 1980.  
Major: Paleontology

Ph D, University of Iowa, 1978.  
Major: Geology

MS, University of Iowa, 1975.  
Major: Geology

BS, Ohio State University, 1973.  
Major: Geology and Mineralogy

Academic and Professional Experience

Professor, Department of Geosciences, Texas Tech University. (September 1, 1995 - Present).  
Teaching: Historical Geology, paleontology, stratigraphy.  
Supervision of graduate student research.  
Research on conodont faunas

TEACHING

Courses Taught

Texas Tech University

GEOL 1101, Physical Geology Laboratory, 3 courses.  
GEOL 1102, Historical Geology Laboratory, 10 courses.  
GEOL 1105, History of Life Laboratory, 15 courses.  
GEOL 1304, Historical Geology, 1 course.  
GEOL 1350, History of Life, 2 courses.  
GEOL 2401, Historical Geology, 11 courses.  
GEOL 3324, Geology for Petroleum Engineers, 12 courses.  
GEOL 3328, Geology of Energy Resources, 6 courses.  
GEOL 3450, Paleontology and Paleocoeology, 5 courses.  
GEOL 4001, Problems in Geosciences, 5 courses.  
GEOL 4101, Undergraduate Seminar, 4 courses.  
GEOL 4300, Independent Studies in Geology, 3 courses.  
GEOL 4312, Undergraduate Research, 13 courses.  
GEOL 5001, Problems in Geosciences, 2 courses.  
GEOL 5300, Indiv Stds In Geology: Micropaleontology, 3 courses.  
GEOL 5311, Micropaleontology, 4 courses.  
GEOL 5420, Geological Correlation, 4 courses.  
GEOL 6000, Master's Thesis, 22 courses.  
GEOL 7000, Research, 19 courses.  
GEOL 8000, Doctor's Dissertation, 14 courses.
Directed Student Learning

Paul Moore, Master's Thesis Committee Chair, "Early Pennsylvanian conodonts from the Sandia Formation, New Mexico," Geosciences. (January 2015 - Present).

Jennifer Kohn, Master's Thesis Committee Chair, "Frasnian (Late Devonian) tentaculitids, North America," Geosciences. (September 2014 - Present).


Allison Brink, Dissertation Committee Member, Geosciences. (June 2013 - Present).

Philip Frederick, Dissertation Committee Co-Chair, "Mississippian and Pennsylvanian conodonts, southeastern Alaska," Geosciences. (January 2013 - Present).

Ken Cassady, Master's Thesis Committee Chair, "Carbonate biofacies of the Konia Limestones of the Middle Desmoinesian Brannon Bridge Limestone, north-Central Texas," Geosciences. (December 2012 - Present).

William Mueller, Dissertation Committee Member, Geosciences. (2007 - Present).


Rachel Moats, Undergraduate Research, "Conodont biostratigraphy of the Beeman Formation (Late Pennsylvanian), in Indian Wells Canyon, Sacramento Mountains, New Mexico," Geosciences. (September 15, 2014 - May 2015).


Chris Treat, Master's Thesis Committee Chair, "Conodont biostratigraphy of the Early Pennsylvanian Provenir Formation near Las Vegas, New Mexico," Geosciences. (November 15, 2011 - December 2014).


Aaron Watters, Master's Thesis Committee Member, "Middle Pennsylvanian Paleogeography of the Taos Trough Region, Northern New Mexico," Geosciences. (September 2013 - August 2014).


Ashley Saelens, Master's Thesis Committee Chair, "Conodonts of the Red House Formation (Atokan, Pennsylvanian), New Mexico," Geosciences. (October 2012 - August 2014).


Philip O'Brien, Master's Thesis Committee Chair, "Detailed lithofacies and conodont biofacies of the Late Pennsylvanian Heebner cyclothem (Oklahoma-Nebraska)," Geosciences. (October 15, 2011 - December 15, 2013).


Brian Ford, Undergraduate Research, "The transition from the clastic-dominated Sandia formation to the carbonate-dominated Porvenir Formation (Pennsylvanian); southwest of Las Vegas New Mexico," Geosciences. (February 15, 2011 - August 15, 2011).


Steve Rosscoe, Dissertation Committee Chair, "Revision of Missourian (Late Pennsylvanian) conodonts, Midcontinent North America," Geosciences. (2009).

RESEARCH

Published Intellectual Contributions

Book Review

**Book, Chapter in Scholarly Book-New**


**Conference Proceeding**


**Geology Guidebook**

Lucas, S. G., Krainer, K., Barrick, J. (2009). *Pennsylvanian stratigraphy and conodont biostratigraphy in the Cerros de Amado, Socorro County, New Mexico*. (vol. 60, pp. 183-212). NEW MEXICO GEOLOGICAL SOCIETY GUIDEBOOK, 60TH FIELD CONFERENCE.

**Journal Article, Academic Journal**


**Journal Article, Professional Journal**

Hogancamp, N., Barrick, J. Geometric morphometric analysis and taxonomic revision of the conodont Idiognathodus simulator (Ellison, 1941), marker species for the global Upper Pennsylvanian Gzhelian Stage, from the Heebner Shale, Midcontinent North America.. *Acta Palaeontologica Polonica*.

**Journal, Edited Special Issue**


Kleffner, M. A., Barrick, J. (2010). Telychian-early Sheinwoodian (Early Silurian) conodont-, graptolite-, chitinozoa-, and event-based chronostratigraphy developed using the graphic


Monograph

Lucas, S. G., Krainer, K., Barrick, J., Vachard, D. The Pennsylvanian System in the Mud Springs Mountains, Sierra County, New Mexico.

Newsletter


Research Report


Presentations Given


Qi, Y. (Presenter & Author), Barrick, J. (Author Only), Hogancamp, N. (Author Only), Wang, Q. (Author Only), Chen, J. (Author Only), Ueno, K. (Author Only), Wang, Y. (Author Only), Wang, X. (Author Only), XVIII International Congress of Carboniferous and Permian, "New Perspectives on the candidate sections for the GSSP of the base of the global Gzhelian
Stage in South China," International Comission on Stratigraphy, Kazan, Russia. (August 11, 2015).


Heckel, P. H. (Presenter & Author), Barrick, J. (Author Only), Nelson, J. (Author Only), Geological Society of America North-Central Meeting, "NEW CONODONT-BASED CORRELATIONS OF DESMOINESIAN (MIDDLE PENNSYLVANIAN) MARINE CYCLOTHEMS BETWEEN ILLINOIS AND MIDCONTINENT BASINS," Omaha, Nebraska. (April 25, 2014).


Frederick, P. (Presenter & Author), Barrick, J. (Presenter & Author), Annual Meeting Geological Society of America, "EARLY TO MIDDLE PENNSYLVANIAN CONODONTS OF THE CENTRAL COLORADO TROUGH AS AN AGE CONTROL FOR THE EARLY STAGES OF

Barrick, J. (Presenter & Author), Qi, Y. (Author Only), Hu, K. (Author Only), Wang, Q. (Author Only), Annual Meeting Geological Society of America, "Kasimovian-Early Gzhelian (Late Pennsylvanian) conodonts from the Naqing (Nashui) section, Guizhou Province, South China," Geological Society of America, Denver, CO. (October 29, 2013).


Parker, M. J. (Presenter & Author), Nestell, G. P. (Presenter & Author), Nestell, M. K. (Author Only), Barrick, J. (Author Only), South-Central Section, Geological Society of America, "Foraminifers of the Clarita Formation (Late Llandovery-Early Ludlow, Silurian) from the Arbuckle Mountains, Oklahoma," Austin, TX. (April 2013).

Barrick, J. (Presenter & Author), Ritter, S. M. (Author Only), Lucas, S. G. (Author Only), Krainer, K. (Author Only), Rocky Mountain Section, Geological Society of America, "Late Pennsylvanian to Early Permian conodont succession in the New Well Peak section, Horquilla Mountains, Big Hatchet Mountains, southwestern New Mexico," Geological Society of America, Albuquerque New Mexico. (May 2012).


Kleffner, M. A. (Presenter & Author), Barrick, J. (Author Only), Karlsson, H. (Author Only), North-Central-North East Region, "Recognition of the Mulde Event and Mulde positive carbon isotope excursion (Late Wenlock; Silurian) in the North American Midcontinent basins and arches region of southern Laurentia (Indiana, Ohio, Ontario)," Geological Society of America, Pittsburgh, PA. (April 20, 2011).


Kleffner, M. A. (Presenter & Author), Barrick, J. (Author Only), Geological Society of America North Central Section Meeting, "Telychian-Early Sheinwoodian (Early Silurian) conodont-, graptolite-, chitinozoa-, and event-based chronostratigraphy developed using the graphic correlation method.," Geological Society of America, Branson, MO. (2010).


Barrick, J. (Presenter & Author), Qi, Y. (Author Only), Wang, Z. (Author Only), THE SCCS WORKSHOP ON GSSPS OF THE CARBONIFEROUS SYSTEM, "Latest Moscovian to earliest Gzhelian (Pennsylvanian conodont faunas from the Naqing (Nashui) section, south Guizhou, China.," Subcommission on Carboniferous Stratigraphy (SCCS), Nanjing, China. (2010).

Corradini, C. (Presenter & Author), Barrick, J. (Author Only), Paleozoic Seas Symposium, Graz, "The Standard Zonation concept – examples from the Silurian conodont zonation.," INSTITUTES FÜR ERDWISSENSCHAFTEN, KARL-FRANZENS-UNIVERSITÄT GRAZ., Graz, Austria. (September 2009).

Contracts, Grants and Sponsored Research

Contract


Sponsored Research


Research in Progress

"Chemostratigraphy and Biostratigraphy of the Late Paleozoic Succession of the Eastern Shelf, Midland Basin" (Planning).

The Permian succession of the Eastern Shelf of the Midland Basin is a major sedimentary and biological archive of climate change and sea-level dynamics through the Late Paleozoic icehouse to greenhouse global climate transition. However, detailed understanding of the timing of global events with changes observed in the Eastern Shelf record is significantly hampered by a lack of reliable biostratigraphic or chemostratigraphic data. In order to robustly tie the Eastern Shelf succession to climate and sea-level events observed in other basins, we propose an integrated biostratigraphic and chemostratigraphic program through this succession.

"Conodont biostratigraphy of Lower and Middle Pennsylvanian Strata, New Mexico" (On-Going).

Preliminary fieldwork, sampling and conodont-based biostratigraphy in various ranges in central and southern New Mexico.

"Late Carboniferous conodont biostratigraphy and chronostratigraphic boundaries in South China" (On-Going).

Collection and analysis of conodonts from South China to assess their value in establishing global chronostratigraphic boundaries there.
"Late Wenlock-Ludlow (Silurian) oceanic events and episodes, southern Laurentia" (Writing Results).
Conodont faunas and stable isotope geochemical across Silurian extinction events in North America

"Conodont biostratigraphy of the Cline and Wolfcamp Shales, West Texas" (On-Going). (January 2014 - Present).
Resolution of age of different interval of shales assigned to the Cline and Wolfcamp Sahles

Research Interests

true, Conodont taxonomy  
Silurian-Pennsylvanian conodonts  
Silurian-Pennsylvanian stratigraphy  
North American Paleozoic stratigraphy

SERVICE

College Service

Committee Member, Arts and Sciences Committee on Academic Programs. (August 2013 - Present).
Committee Member, Graduate School Review of Petroleum Engineering. (September 2009 - August 2010).
Committee Member, Arts & Sciences Scholarship Committee. (January 2009 - March 2010).

Department Service

Committee Member, Geosciences Graduate Committee. (September 2014 - Present).
Committee Member, Undergraduate Committee. (January 2013 - August 2014).
Committee Chair, Undergraduate Committee. (January 2011 - December 2012).
Committee Chair, Geosciences Space Utilization Committee. (April 2010 - December 2012).
Committee Chair, Newsletter. (June 1, 2008 - May 1, 2012).

Professional Service

Reviewer, Journal Article, Palaeontologica Electronica. (July 2013).
Reviewer, Journal Article, Stratigraphy. (December 2011).

**Service/Performance Partnerships**

Conodont biostratigraphy, Engaged Research and Creative Activity, Technical or Expert Assistance, Consultation on biostratigraphic correlations with colleagues in academic institutions and industry, Colorado. (January 2013 - December 2013).

**GENERAL**

**Consulting**

Academic, Researchers at others universities. (September 1, 2000 - Present).

For Profit Organization, Various petroleum and mining companies. (September 1, 2000 - Present).

**Professional Memberships**

Geological Society of America.

Palaeontological Association.

Paleontological Society.

Sigma Xi.

Society for Sedimentary Geology.

Voting Member, Subcommission on Carboniferous Stratigraphy.
Education and Post Graduate Training

Ph D, University of Oklahoma, 2008.
Major: Meteorology
Dissertation Title: Charging Regions, Regions of Charge, and Storm Structure in a Partially Inverted Polarity Supercell Thunderstorm

MS, University of Oklahoma, 2005.
Major: Meteorology
Dissertation Title: Electrical and Polarimetric Radar Observations of a Multicell Storm in TExAS

Major: Meteorology

Academic and Professional Experience

Assistant Professor, Texas Tech University, Dept. of Geosciences, Atmospheric Science Group. (August 2010 - Present).

Research Associate, University of Maryland, College Park. (May 2008 - August 2010).
Postdoc in lightning mapping and satellite observations of lightning

TEACHING

Courses Taught

Texas Tech University
ATMO 1100, Atmospheric Science Laboratory, 38 courses.
ATMO 1300, Introduction to Atmospheric Science, 3 courses.
ATMO 3301, General Meteorology, 1 course.
ATMO 4300, Independent Studies in Atmospheric Science, 4 courses.
ATMO 4312, Undergraduate Research, 1 course.
ATMO 5321, Cloud and Precipitation Physics, 3 courses.
ATMO 5322, Atmospheric Electricity, 1 course.
ATMO 5331, Analysis of Geophysical Data Fields, 2 courses.
ATMO 6000, Master's Thesis, 18 courses.
ATMO 7000, Research, 16 courses.
GEOL 4312, Undergraduate Research, 2 courses.
GEOL 8000, Doctor's Dissertation, 1 course.

Non-Credit Instruction


Workshop, 4 participants. (November 5, 2012).
Directed Student Learning

Samantha Berkseth, Master's Thesis Committee Chair. (September 2014 - Present).

Vicente Salinas, Master's Thesis Committee Chair. (September 2014 - Present).

Matthew Mahalik, Master's Thesis Committee Member, Atmospheric Science Group. (May 2014 - Present).

Casey Griffin, Master's Thesis Committee Member, Atmospheric Science Group. (April 2014 - Present).

Vanna Sullivan, Dissertation Committee Chair, Atmospheric Science Group. (May 2013 - Present).

William Scott Gunter, Dissertation Committee Member, Atmospheric Science Group. (January 2012 - Present).

Anthony Reinhart, Dissertation Committee Member, "Verification of Numerically Simulated Supercell Cold Pools using Data Assimilation," Atmospheric Science Group. (January 2011 - Present).

Candace Wood, Master's Thesis Committee Chair, Atmospheric Science Group. (August 2010 - Present).

Jennifer Daniel, Master's Thesis Committee Chair, Atmospheric Science Group. (August 2010 - Present).

Phillip Ware, Master's Thesis Committee Chair. (October 2013 - August 2015).

Daniel Vecellio, Master's Thesis Committee Member, Atmospheric Science Group. (May 2013 - December 2014).

Timothy Cermak, Master's Thesis Committee Member, Atmospheric Science Group. (January 2013 - August 2014).

Paul Prososki, Master's Thesis Committee Member, Atmospheric Science Group. (May 2012 - August 2014).

Ashley Morris, Undergraduate Research, Geosciences. (November 2013 - May 2014).


Vicente Salinas, Undergraduate Research. (November 2012 - May 2014).

Michael Hollan, Master's Thesis Committee Member, Atmospheric Science Group. (May 2012 - October 2013).

Camaron Plourde, Master's Thesis Committee Chair, Atmospheric Science Group. (August 2011 - June 2013).

Patrick Hawbecker, Master's Thesis Committee Member, Atmospheric Science Group. (May 2012 - May 2013).
Vanna Sullivan, Master's Thesis Committee Chair, Atmospheric Science Group. (August 2011 - May 2013).

Natalie Gusack, Master's Thesis Committee Chair, Atmospheric Science Group. (August 2010 - August 2012).


Anthony Reinhart, Qualifying Exam Committee Member, "Verification of Numerically Simulated Supercell Cold Pools using Data Assimilation," Atmospheric Science Group. (November 2011).

William Scott Gunter, Master's Thesis Committee Member, Atmospheric Science Group. (September 2010 - December 2010).

**RESEARCH**

**Published Intellectual Contributions**

**Cited Research**


**Conference Proceeding**


Bruning, E., Berkseth, S. M., Salinas, V., Chmielewski, V., Ware, P. (2015). Observations of the spatial and temporal distribution of lightning flash sizes. Eos Trans. AGU, Fall Meet. Suppl. (pp. AE21A-02 (invited)).


**Journal Article, Academic Journal**


**Presentations Given**


Bruning, E., Thomas, R. J., Krehbiel, P. R., Rison, W., Sixth Conference on the Meteorological Applications of Lightning Data, AMS Annual Meeting, "Fractal-based lightning channel length estimation from convex-hull flash areas for DC3 Lightning Mapping Array data," American Meteorological Society, Austin, TX. (January 2013).


Sullivan, V. C. (Presenter & Author), Bruning, E. (Author Only), Kang, S.-I. (Author Only), 2012 Fall Meeting, "Observations of the vertical electric field on days with airborne dust in West Texas," American Geophysical Union, San Francisco, CA. (December 3, 2012).


Conder, M. R. (Presenter & Author), Cobb, S. (Author Only), Skwira, G. (Author Only), Bruning, E. (Author Only), Daniel, J. (Author Only), 26th Conference on Severe Local Storms, "Multi-


Bruning, E. (Presenter & Author), GOES-R Geostationary Lightning Mapper Science Meeting, "West Texas LMA: Deployment and operations update," NOAA, Huntsville, AL. (September 2011).


Media Contributions

Internet

TTU National Wind Institute news item. (April 15, 2014).

Magazine

TTU Arts & Sciences Alumni Magazine. (December 31, 2014).

Contracts, Grants and Sponsored Research

Grant


Bruning, E. (Principal), Guynes, J. (Supporting), "Collaborative Research: Thunderstorm Influences on Lightning and Atmospheric Chemistry in Oklahoma and North Texas during the Deep Convective Clouds and Chemistry (DC3) Project," Sponsored by National Science Foundation, Federal, $272,000.00. (January 1, 2012 - December 31, 2016).


**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Research Interests**

true, Thunderstorms, lightning, atmospheric electricity, cloud and precipitation microphysics, weather observations, weather radar and other instrumentation

**SERVICE**

**University Service**

Expert, TTU Public Relations. (October 17, 2011 - October 22, 2011).

**Department Service**

Faculty Mentor, Johannes Dahl. (August 2013 - Present).

Faculty Advisor, Atmospheric Science Minor. (January 2013 - Present).

Committee Member, TTU IT Network Site Coordinator. (August 2011 - Present).

Committee Member, Atmospheric Science Search Committee. (September 2012 - August 2013).

**Professional Service**

Instrument coordinator, Los Alamos National Laboratory. (August 2010 - Present).

Committee Member, American Meteorological Society. (January 2012 - January 2016).
Instrument coordinator, Duke University. (October 2010 - December 2015).
Reviewer, Journal Article, American Geophysical Union. (April 2015).
Reviewer, Grant Proposal, National Science Foundation. (April 2015).
Reviewer, Journal Article, American Geophysical Union. (December 2014).
Committee Member, American Meteorological Society. (January 2012 - December 2014).
Reviewer, Journal Article, American Meteorological Society. (September 2014).
Reviewer, Journal Article, American Meteorological Society. (June 2014).
Reviewer, Journal Article, American Meteorological Society. (June 2014).
Reviewer, Grant Proposal, Maryland Industrial Partnerships Program. (May 2014).
Editorial Review Board Member, American Meteorological Society. (December 2012 - December 2013).
Reviewer, Journal Article, American Meteorological Society. (September 2013).
Reviewer, Grant Proposal, Agence Nationale de la Recherche (France). (April 2013).
Reviewer, Grant Proposal, National Science Foundation. (April 2013).
Reviewer, Journal Article, American Geophysical Union. (January 2013).
Reviewer, Grant Proposal, National Science Foundation. (January 2013).
Session Chair, American Geophysical Union. (December 3, 2012 - December 7, 2012).
Reviewer, Journal Article, American Meteorological Society. (September 2012).
Reviewer, Journal Article, American Geophysical Union. (March 2012).
Reviewer, Study Section, United States Global Change Research Program. (February 2012).
Reviewer, Conference Paper, American Geophysical Union. (December 5, 2011 - December 9, 2011).
Presenter, TTU Student Chapter of the American Meteorological Society, Lubbock, TX. (February 26, 2011).

Public Service

Research profile, NOAA National Severe Storms Laboratory. (April 2015).
Interviewee, research profile, NASA Earth Observing System Data and Information System (EOSDIS). (March 2015).
Interviewee, lightning expert, KAMC Lubbock. (January 2015).
Interviewee for research profile, TTU A&S Alumni Magazine. (December 2014).
Interviewee for news article, Cimate Wire. (May 29, 2013).
Guest Speaker, New Deal High School. (February 15, 2013).
Quoted in article, Texas Co-op Power Magazine. (July 3, 2012 - November 2012).
Guest Speaker, New Deal High School. (November 2011 - December 2011).
Guest Speaker, New Deal High School. (March 2011 - April 2011).

GENERAL

Professional Memberships

American Geophysical Union. (2002 - Present).
Dr. Guofeng Cao  
Texas Tech University  
(806) 834-8920  
guofeng.cao@ttu.edu

Education and Post Graduate Training

Postdoctoral, University of Illinois, 2013.  
Major: Geography  
Supporting Areas of Emphasis: Cyberinfrastructure and Geographic Information Science,  
High Performance Computing

Ph D, University of California, 2011.  
Major: Geography  
Supporting Areas of Emphasis: Geogarphic Information Science and Environmental Statistics  
Dissertation Title: A Geostatistical Framework for Categorical Spatial Data Modeling

MS, University of California, 2009.  
Major: Probability and Statistics  
Supporting Areas of Emphasis: Applied Statistics

MS, Chinese Academy of Sciences, 2004.  
Major: Cartography and Geographic Information Science  
Dissertation Title: Real-time Rendering of Large-scale Terrain Dataset

BA, Zhejiang University, 2001.  
Major: Earth Science with minor in Computer Science  
Supporting Areas of Emphasis: Remote Sensing  
Dissertation Title: WebGIS based on CORBA

TEACHING

Courses Taught

Texas Tech University
- GEOG 3340, Introduction to Research in Human Geography, 1 course.  
- GEOG 5310, Readings in Geography, 5 courses.  
- GEOG 6000, Master's Thesis, 1 course.  
- GEOG 7000, Research, 4 courses.  
- GEOL 8000, Doctor's Dissertation, 2 courses.  
- GIST 4302, Spatial Analysis and Modeling, 12 courses.  
- GIST 5302, Spatial Analysis and Modeling, 10 courses.

Directed Student Learning

Thu Nguyen, Dissertation Committee Member, Geosciences. (June 1, 2015 - Present).  
Ashely Morris, Master's Thesis Committee Chair, Geosciences. (May 15, 2015 - Present).  
Morgan Kraft, Master's Thesis Committee Chair, Geosciences. (May 15, 2015 - Present).  
Ying Liu, Dissertation Committee Chair, Geosciences. (September 2014 - Present).
Fahad Almutlaq, Dissertation Committee Member, Geosciences. (September 2014 - Present).

Marina Fisher-Phelps, Dissertation Committee Member, Biological Sciences. (September 2014 - Present).

Aaron Hardin, Master's Thesis Committee Member, Geosciences. (June 1, 2014 - Present).

Feixiong Luo, Master's Thesis Committee Chair, Geosciences. (May 2014 - Present).

Azadeh Mousavi, Other, "Decentralized Data Mining for Event Detection in Spatiotemporal Fields." (April 1, 2015 - July 1, 2015).

Lionel Plummer, Dissertation Committee Member, "An Examination of Hydrologic Restoration Efforts for Wetland Mitigation Banks," Natural Resources Management. (September 1, 2013 - December 2014).


Jason Post, Master's Thesis Committee Member, Geosciences. (December 2013 - May 2014).

Tiffany Lambert, Master's Thesis Committee Member, Geosciences. (November 2013 - May 2014).

RESEARCH

Published Intellectual Contributions

Abstract


Book, Chapter in Scholarly Book-New


Book, Chapter in Scholarly Book-Revised


Conference Proceeding


**Journal Article, Academic Journal**


**Presentations Given**

Liu, Y. (Presenter & Author), Luo, F. (Presenter & Author), Cao, G. (Presenter & Author), The 13th International Conference of Geocomputation, Dallas, "Track Spatiotemporal Spread of Public Concerns on Ebloa in the US via Twitter," Dallas. (May 1, 2015).


Contracts, Grants and Sponsored Research

Grant

Cao, G. (Co-Principal), Solis, P. (Principal), Mulligan, K. (Co-Principal), Portillo Quintero, C. (Co-Principal), "Mappers Without Borders," Sponsored by USAID, Federal, $999,000.00. (September 29, 2015 - December 31, 2019).

Cao, G. (Co-Principal), Barbato, L. (Co-Principal), Mulligan, K. (Principal), "Development of a GIS Model to Project and Map Future Water Availability," Sponsored by USDA ARS, Federal, $40,769.00. (October 1, 2015 - September 30, 2016).

Cao, G. (Co-Principal), Ballou, M. (Principal), Barbato, L. (Co-Principal), Mulligan, K. (Co-Principal), Burow, M. (Co-Principal), Williams, R. (Co-Principal), Seshadri, S. (Co-Principal), Mendu, V. (Co-Principal), West, C. (Co-Principal), Trojan, S. (Co-Principal), Ritchie, G. (Co-Principal), Woodward, J. (Co-Principal), Sarturi, J. (Co-Principal), "Improving Water Productivity and New Water Management Technologies to Sustain Rural Economies-TTU," Sponsored by United States Department of Agriculture, Federal, $340,222.00. (September 1, 2014 - August 31, 2016).


Vanos, J. (Co-Principal), Cao, G. (Principal), Chen, Y. (Co-Principal), "Transdisciplinary Research Academy, Texas Tech," Texas Tech University, $4,000.00. (March 2015).

Vanos, J. (Co-Principal), Gittner, L. (Principal), Cao, G., "Socio-environmental Factors and Health Inequalities," Sponsored by National Institute of Health, $12,729.00. (February 1, 2015 - Present).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**SERVICE**

**Department Service**

Event Organizer, Geography Seminar. (September 2014 - Present).


Committee Member, Search Committee of Climate Science/Remote Sensing Position. (October 2014 - February 2015).
Guest lecture for 'Geographical Thoughts'. (November 18, 2013).

**Professional Service**


Reviewer, Journal Article, Transactions in GIS. (March 1, 2015 - Present).


Committee Member, AAG 2015 Symposium on CyberGIS for Fostering New Frontiers of Geographic Research and Education. (December 1, 2014 - Present).

Reviewer, Journal Article, Mathematical Geosciences. (December 1, 2014 - Present).

Committee Member, 7th ACM SIGSPATIAL International Workshop on Location-based Social Network. (September 1, 2014 - Present).

Reviewer, Conference Paper, 7th ACM SIGSPATIAL International Workshop on Location-based Social Network. (September 1, 2014 - Present).


Session Chair, Association of American Geographers, Chicago, IL. (April 21, 2015 - April 25, 2015).


**GENERAL**

**Consulting**
Academic, National Institute on Minority Health and Health Disparities Pilot Research Core: Center of Excellence at Meharry (HDRCOE), Meharry Medical College. (September 1, 2014 - August 31, 2015).

Professional Memberships

ACM SIGSPATIAL. (June 2009 - Present).

American Association of Geographers. (October 1, 2007 - Present).

Development Activities Attended

"Faculty Research Development Program," Texas Tech University, Lubbock, TX, USA. (October 2013 - December 2013).
Dr. Perry L. Carter  
Texas Tech University  
(806) 742-2466  
perry.carter@ttu.edu

Education and Post Graduate Training

Ph D, Ohio State University, 1998.  
Major: Geography  
Dissertation Title: , Spatial Consumption Decision-Making: Six Studies of Restaurant Choice

MA, University of Georgia, 1986.  
Major: Geography  
Dissertation Title: Economic Transition in the Less Developed World

Academic and Professional Experience

Associate Professor, Texas Tech University. (July 1, 2001 - Present).

TEACHING

Courses Taught

Texas Tech University

2351, Regional Geography of the World, 1 course.  
3340, Introduction to Research in Human Geography, 1 course.  
GEOG 2351, Regional Geography of the World, 4 courses.  
GEOG 3337, Economic Geography, 2 courses.  
GEOG 3340, Introduction to Research in Human Geography, 5 courses.  
GEOG 3350, Social and Cultural Geography, 2 courses.  
GEOG 3351, Geography of Urban Places, 3 courses.  
GEOG 4369, Independent Research in Geography, 5 courses.  
GEOG 5303, Advanced Human Geography, 9 courses.  
GEOG 5310, Readings in Geography, 11 courses.  
GEOG 5340, Research Design and Methodology in Geography, 3 courses.  
GEOG 6000, Master's Thesis, 5 courses.  
GEOG 7000, Research, 6 courses.  
GEOL 8000, Doctor's Dissertation, 1 course.  
LPMD 7000, Research, 1 course.  
LPMD 8000, Doctor's Dissertation, 2 courses.  
WS 3342, Introduction to Research in Human Geography, 1 course.

Directed Student Learning

Jason Post, Master's Thesis Committee Chair, "Hazard Sites and Racial and Ethnic Vulnerable," Geosciences. (December 1, 2013 - Present).

Jason Post, Master's Thesis Committee Chair, "Hazard Sites and Racial and Ethnic Vulnerable," Geosciences. (December 1, 2013 - Present).

Cullen Dunkerson, Master's Thesis Committee Chair, "Why They Stay: Place Rootness in Moore, Oklahoma," Geosciences. (January 20, 2013 - Present).

Brittany Walker, Master's Thesis Committee Chair, "Romanian Women in the United States," Geosciences. (September 1, 2011 - Present).

Wendell Robbins, Dissertation Committee Member, "Outsourcing The American Dream: A Survey and Analysis of the Effect of Globalization on Call Center Workforces within the United States," Other (Outside Texas Tech University). (January 15, 2008 - Present).


Jack Phelps, Master's Thesis Committee Chair, Other (Outside Texas Tech University). (September 1, 2011 - December 31, 2012).

Jack Phelps, Master's Thesis Committee Chair, "The Association between Tree Canopy Cover and Socio-Demographics in Lubbock, Texas," Geosciences. (September 1, 2011 - October 31, 2012).

Paul Coleman, Dissertation Committee Chair, Other (Within Texas Tech University). (January 1, 2011 - December 31, 2011).

Brian Horton, Undergraduate Honors Thesis, "Intersectionality and the Cult of True Womanhood: A study of race and gender roles in 19th century Texas," Other (Within Texas Tech University). (September 14, 2009 - May 1, 2010).

RESEARCH

Published Intellectual Contributions

Book, Chapter in Scholarly Book-New


Journal Article, Academic Journal

Carter, P., Dwyer, O., Butler, D. Defetishizing the Plantation: African-Americans in the Memorialized South. Historical Geography.


Dwyer, Q., Butler, D., Carter, P. Commemorative Surrogation and heritage tourism: Visitor reactions to the American South’s changing heritage landscape. *Tourism Geographies, 14.*


**Presentations Given**


**Contracts, Grants and Sponsored Research**

**Grant**


Carter, P. (Co-Principal), "Transformation of Racialized American Southern Heritage Landscapes," Sponsored by National Science Foundation (NSF), Texas Tech University, $400,000.00. (March 1, 2014 - March 1, 2017).


**Intellectual Contributions in Submission**

Journal Article, Academic Journal
Carter, P. Placing Whiteness in Latin America: National Bodies, Identity and the Female Form. 
Cultural Geographies.

Research Interests

true, Research Programs:
At present most of my work revolves around issues of identity and space. Specifically, how individuals’ raced, gendered, sexed, and classed positions work to construct the spaces they inhabit while simultaneously these raced, gendered, sexed, and classed spaces work to construct the individuals inhabiting them. We are the places in which we are rooted and the spaces that we daily negotiate.

My work is probably best categorized as social/cultural geography, yet my background is in economic geography. I do not see a distinct boundary between these two subfields. The economy is a cultural product. When I study African-American travel agents, or call center employees, I am examining not only their day-to-day lives and the role that space plays in their lives, I am also examining relations of exchange across space. The African-American travel agent who fully embraces web technology because she sees it as a means of attracting White consumers who would otherwise be fearful of visiting her office in an African-American neighborhood and the call center worker who makes a spatial calculation of how far from home she can commute to work and still get back in time to pick up her child from daycare, are both examples of how the social geographic and spatial economic are one and the same.

A feminist and post-structural theoretical frameworks undergirds most of my work. I find these epistemologies offer a means of understanding identity positions and the role that space and place play in the development of identities. Feminism has been particularly useful because much of my work has centered on women and Blacks, and I have found feminism to be a useful instrument in critically examining taken-for-granted notions about gender, sexuality, and “race.”

Theory is always embedded in the work we do even if it is unacknowledged. Though I recognize the importance of theory, I consider myself a methodologist rather than a theorist. I like data. I like collecting it and I like analyzing it. I am familiar with the ongoing debates in Geography and the Social Sciences over the merits of quantitative versus qualitative approaches; however, I do not understand the grounds for the debate. Different tools should be applied to different problems. I started my career as a quantitative geographer. My dissertation employed mostly discrete choice modeling. When I began working on issues of identity and space, it was obvious that quantitative methods were not appropriate tools. Most of my work in this area has been carried out using interviews and discourse analysis. However, when my friend, David Butler, asked me to join him on a project dealing with call center workers journeys to work, it was obvious that quantitative methods should be applied to this task.

I do not like to be fixed to a category. I was attracted to Geography in part because of its lack of solid boundaries and its vast intellectual field. I feel that I am a better researcher because of my ambulations across the discipline.

SERVICE

Department Service

Graduate Advisor, Geography Master's Program.

Professional Service

Editorial Review Board Member, The Professional Geographer.

Committee Member, Association of American Geographers. (July 1, 2012 - Present).
Table Leader, College Board. (May 31, 2013 - July 9, 2013).

GENERAL

Professional Memberships

The Association of American Geographers. (September 1, 1993 - Present).
Professor Sankar Chatterjee
Texas Tech University
(806) 742-1986
sankar.chatterjee@ttu.edu

Education and Post Graduate Training

Postdoctoral Fellow, Smithsonian Institution, 1978.
Major: Paleobiogeography
Supporting Areas of Emphasis: plate tectonics

Ph D, Calcutta University, 1970.
Major: Geology
Supporting Areas of Emphasis: Paleontology
Dissertation Title: A rhynchosaur from the Maleri Formation of India

MS, Jadavpur University, 1964.
Major: Geology
Supporting Areas of Emphasis: structural geology

BS, Jadavpur University, 1962.
Major: Geology
Supporting Areas of Emphasis: structural geology

Academic and Professional Experience

Paul Whitfield Horn Professor of Geosciences, Texas Tech University. (September 1984 - Present).
Teaching and Research at the university

Fulbright-Nehru Excellence Professor, Fulbright. (December 24, 2014 - June 18, 2015).
Research and teaching at different institutions in India

TEACHING

Courses Taught

Texas Tech University
Vertebrate Paleontology, 1 course.
GEOL 1101, Physical Geology Laboratory, 10 courses.
GEOL 1102, Historical Geology Laboratory, 3 courses.
GEOL 1105, History of Life Laboratory, 9 courses.
GEOL 1350, History of Life, 5 courses.
GEOL 2401, Historical Geology, 1 course.
GEOL 4300, Independent Studies in Geology, 2 courses.
GEOL 4312, Undergraduate Research, 3 courses.
GEOL 5001, Problems in Geosciences, 1 course.
GEOL 5101, Seminar, 1 course.
GEOL 5327, Problems in Paleontology, 1 course.
GEOL 5410, Vertebrate Paleontology, 2 courses.
GEOL 6000, Master's Thesis, 9 courses.
GEOL 7000, Research, 11 courses.
GEOL 8000, Doctor's Dissertation, 19 courses.
MUSM 5325, Museum Field Methods, 5 courses.
MUSM 5328, Museum Practicum, 9 courses.
MUSM 6000, Master's Thesis, 10 courses.
MUSM 6001, Museum Internship, 12 courses.
MUSM 7000, Research, 10 courses.

Directed Student Learning


Phil Frederick, Master's Thesis Committee Member, "Anatomy and locomotion of a basal pterosaur Rhamphorhynchus muensteri from the Upper Jurassic of Germany," Geosciences. (January 12, 2012 - Present).

Talpur Zujjaj, Master's Thesis Committee Chair, Museum Science. (2011 - Present).

Alyson Brink, Master's Thesis Committee Member, Geosciences. (2009 - Present).

Joseph Schubert, Master's Thesis Committee Member. (2009 - Present).

Bill Mueller, Dissertation Committee Chair, Geosciences. (2006 - Present).

Caleb Lewis, Master's Thesis Committee Member, Geosciences. (2009 - 2014).

Volcan Sarigul, Dissertation Committee Chair, Geosciences. (September 9, 2011 - May 2014).


Raquel Marchan, Dissertation Committee Member, Biological Sciences. (September 2010 - February 2013).

Nicole Reynaud, Doctoral Advisory Committee Member, Geosciences. (2009 - 2012).

Chris Treat, Master's Thesis Committee Member, Geosciences. (2009 - 2012).

Melissa Westerfield, Master's Thesis Committee Member, Geosciences. (2009 - 2012).


John Fronimos, Master's Thesis Committee Member, Geosciences. (2009 - June 2010).

Cristina Chavez, Master's Thesis Committee Chair, Geosciences. (2007 - 2009).

RESEARCH

Published Intellectual Contributions
Abstract


Book, Chapter in Scholarly Book-New


Book, Scholarly-Revised


Conference Proceeding


Journal Article, Academic Journal


**Journal Article, Professional Journal**


**Presentations Given**


Chatterjee, S. (Chair), Gondwana 14, "Tectonic evolution and the paleoclimatic conditions of the Indian plate during its longest journey," Gondwana 14 Scientific Committee, Buzios, Rio de Janeiro, Brazil. (September 26, 2011).


Chatterjee, S., Design and Nature Conference, "Pterodrone: a pterodactyl-inspired unmanned air vehicle that flies, walks, climbs, and sails,," Wessex Institute, Pisa, Italy. (2010).


Chatterjee, S., Invited Lecture, "Pterodrone: an unmanned aerial vehicle," Birbal Sahni Institute of Paleobotany, Lucknow, India. (July 2010).

Chatterjee, S., "What killed the dinosaurs?" Indian Institute of Science, Kolkata, India. (December 2009).


Media Contributions

Magazine
The Economist, Discover, National Geographic. (2009).

Newspaper

TV
Atlantic Productions. (December 6, 2010).

History channel. (2009).

Contracts, Grants and Sponsored Research

Grant


Research in Progress


"Shiva crater and the death of the dinosaurs" (On-Going). (2012 - Present).

"The River of Life" (Complete). (2012 - Present).
A book manuscript submitted to the University of Chicago Press for publication

Research Interests


SERVICE

University Service

Committee Member, Urbanovsky Fellowships. (2000 - 2011).


Department Service

Committee Chair, Curator of Paleontology. (1979 - 2010).

Professional Service

Editor, Journal Editor, Netherlands Scientific Journal.

Reviewer, Grant Proposal, NSF.

Editor, Associate Editor, Paleontological Society. (October 2008 - September 2011).

Service/Performance Partnerships

Dinosaur Hall, Engaged Research and Creative Activity, Relationship Development, The project is for scientific literacy among LISD school children. Dinosaur Hall at the Museum is used to introduce children to natural history and changing environment, Texas. (January 2015 - December 2015).

GENERAL

Licensures and Certifications

CPR-Adult, American Red Cross. (August 2010 - Present).
Professional Memberships


Member, Paleontological Society. (1977 - 2011).

Member, Society of Vertebrate Paleontology. (1976 - 2011).

Development Activities Attended

Faculty Fellowship, "Fulbright-Nehru Excellence Professor," Fulbright, Kolkata, India. (December 24, 2014 - June 18, 2015).
Dr. Johannes Dahl  
Texas Tech University  
(806) 834-6197  
johannes.dahl@ttu.edu

Education and Post Graduate Training

Postdoctoral, North Carolina State University, 2013.  
Major: Supercell dynamics  
Supporting Areas of Emphasis: Cloud-scale modeling

Ph D, Ludwig-Maximilians University Munich/German Aerospace Center, 2010.  
Major: Mesoscale modeling  
Supporting Areas of Emphasis: Cloud electrification  
Dissertation Title: Development and implementation of a new lightning parameterization in a  
mesoscale weather prediction model

Diploma (corresponds to M.Sc. degree), Free University of Berlin, 2006.  
Major: Convective storm dynamics  
Supporting Areas of Emphasis: Weather forecasting  
Dissertation Title: Supercells - their Dynamics and Prediction

Academic and Professional Experience

Assistant Professor, Texas tech University. (September 1, 2013 - Present).

Post-Doc, North Carolina State University. (July 1, 2010 - August 14, 2013).  
Post-doctoral research associate

TEACHING

Courses Taught

Texas Tech University  
ATMO 1100, Atmospheric Science Laboratory, 15 courses.  
ATMO 1300, Introduction to Atmospheric Science, 4 courses.  
ATMO 5328, Synoptic Meteorology, 1 course.  
ATMO 6000, Master's Thesis, 3 courses.  
ATMO 7000, Research, 7 courses.

Non-Credit Instruction

Workshop, European Severe Storms Laboratory, 7 participants. (June 29, 2015 - July 3, 2015).

Workshop, European Severe Storms Laboratory, 10 participants. (June 22, 2015 - June 26, 2015).

RESEARCH

Published Intellectual Contributions

Conference Proceeding


**Journal Article, Academic Journal**


**Presentations Given**


Media Contributions

Radio

KTXT 88.1 The Raider. (May 2015).

SERVICE

Department Service

Committee Chair, MSc thesis committee: Matthew Mahalik. (June 2015).
Committee Member, MSc thesis committee: Phillip Ware. (June 2015).
Committee Member, Search committee for seismology position. (January 2015 - June 2015).
Committee Member, MSc thesis committee: Casey Griffin. (May 2015).

Professional Service

Editor, Associate Editor, Monthly Weather Review. (January 2015 - Present).
Editor, Associate Editor, Weather and Forecasting. (January 2014 - Present).
Steering committee member and co-founder, European Storm Forecast Experiment. (November 2002 - Present).

Co-chair, 8th European Conference on Severe Storms, to be held in Wiener Neustadt, Austria, 14-18 September, 2015. (August 2014 - September 2015).

GENERAL

Professional Memberships

American Meteorological Society.
European Severe Storms Laboratory.
German Meteorological Society.

Development Activities Attended


Seminar, "New Faculty Research Orientation," TTU/TLPDC, Lubbock, TX, United States. (January 13, 2014).

Seminar, "Faculty Proposal Development Program," TTU, Lubbock, TX, United States. (December 6, 2013).

Seminar, "Tenure Academy," TTU, Lubbock, TX, United States. (November 19, 2013).


Seminar, "Faculty Proposal Development Program," TTU, Lubbock, TX, United States. (November 1, 2013).

Seminar, "I Wondered How Much Students Could Learn in 1 Second," TTU/TLPDC, Lubbock, TX, United States. (October 30, 2013).

Seminar, "Large Lecture Series: Cultivating Mindfulness in the Large Classroom," TTU/TLPDC, Lubbock, TX, United States. (October 23, 2013).

Workshop, "Spot-on Speaking: Improving Voice Dexterity in the Classroom," TTU/TLPDC, Lubbock, TX, USA. (October 17, 2013).

Seminar, "Budget Basics Orientation," TTU/TLPDC, Lubbock, TX, United States. (October 11, 2013).


Seminar, "Faculty Proposal Development Program," TTU, Lubbock, TX, United States. (October 3, 2013).

Seminar, "Building Bridges in Advising," TTU/TLPDC, Lubbock, TX, USA. (October 2, 2013).

Workshop, "Cayuse Training," TTU/TLPDC, Lubbock, TX, United States. (September 20, 2013).

Workshop, "What the Best Teachers Do: Changes I've Made to My Teaching," TTU/TLPDC, Lubbock, TX, USA. (September 16, 2013).
Education and Post Graduate Training

Ph D, University of Florida, 2002.
Major: Geography
Supporting Areas of Emphasis: Paleobotany
Dissertation Title: Yew (Taxus baccata L.) Population Dynamics in Youghal, Co., Cork, Ireland: Cultural and Biogeographical influences from 5000BP to Present

MA, Florida Atlantic University, 1998.
Major: Geography
Dissertation Title: Remote Sensing as Appropriate Technology for Habitat Management of the Endangered St. Vincent Parrot (Amazona guildingii), Less Antilles

BS, Humboldt State University, 1995.
Major: Natural Resource Planning and Interpretation

Leadership Awards and Honors

Misc. (February 2011).

TEACHING

Courses Taught

Texas Tech University
GEOG 2351, Regional Geography of the World, 8 courses.
GEOG 3301, Remote Sensing of the Environment, 8 courses.
GEOG 3310, Environmental Change, 1 course.
GEOG 4321, Biogeography, 2 courses.
GEOG 4369, Independent Research in Geography, 3 courses.
GEOG 5301, Remote Sensing of the Environment, 10 courses.
GEOG 5304, Advanced Physical Geography, 3 courses.
GEOG 5309, Seminar in Regional Analysis, 1 course.
GEOG 5310, Readings in Geography, 6 courses.
GEOG 5312, Seminar in Geographic Thought, 1 course.
GEOG 6000, Master's Thesis, 4 courses.
GEOG 7000, Research, 3 courses.

Directed Student Learning

Ying Liu, Dissertation Committee Chair, Geosciences. (2013 - Present).
Daniel Holman, Dissertation Committee Member, Computer Science. (2013 - Present).
Prudence Venner, Master's Thesis Committee Chair, Geosciences. (2013 - Present).
Adam McCullough, Master's Thesis Committee Member, Biological Sciences. (2013 - Present).
Tiffany Lambert, Master's Thesis Committee Member, Geosciences. (2011 - Present).

Jason Post, Master's Thesis Committee Chair, Geosciences. (2012 - January 2014).

Samaneh Tabrizi, Master's Thesis Committee Chair, Geosciences. (2012 - December 2013).

Jack Phelps, Master's Thesis Committee Member, Geosciences. (2011 - 2012).

Melissa Muharam, Qualifying Exam Committee Member, Plant & Soil Science. (2011 - 2012).

Melissa Muharam, Dissertation Committee Member, Plant & Soil Science. (2010 - 2012).


Sam Whitehead, Dissertation Committee Member, Architecture. (2009 - 2011).

RESEARCH

Published Intellectual Contributions

Journal Article, Academic Journal


Manuscript


Newspaper


Presentations Given


Media Contributions

Internet


Ron Ramsey Lieutenant Governor website. (August 21, 2013).

Newspaper


Contracts, Grants and Sponsored Research

Grant


Intellectual Contributions in Submission

Journal Article, Academic Journal


Research Report


Delahunty, T. Spatial Distribution of Equine Use. Mountain City, TN: Doe Mountain Recreation Area Master Plan.


SERVICE
University Service

   Committee Member, College of Arts and Sciences Dean Search.

Department Service

   Committee Member, Strategic Plan. (December 2011 - February 2012).

Professional Service


   Member, Southeast Division of the Association of American Geographers.


   Committee Member, Southeastern Division of Association of American Geographers. (2009 - 2012).


Public Service

   Advisor, Doe Mountain Recreation Area (DMRA) Authority Board.

   Advisor, Natural Resources Committee (DMRA).

   Officer, Secretary, Roads and Trails Committee (DMRA).

   Advisor, Master Plan Committee. (May 2013).

Service Awards and Honors

   Service, Community

Dr. Gary S. Elbow
Texas Tech University
(806) 834-0354
gary.elbow@ttu.edu

Education and Post Graduate Training

Ph D, University of Pittsburgh, 1972.
Major: Geography
Supporting Areas of Emphasis: Latin American Studies, International Development
Dissertation Title: Cultural Factors in the Spatial Organization of Three Highland Guatemalan
Towns

MA, University of Oregon, 1964.
Major: Geography
Dissertation Title: Regional Variations in Minifundio Occupance in the Ubate Valley, Colombia

BS, Oregon State University, 1960.
Major: General Science (Natural History/Geosciences)

Academic and Professional Experience

Professor, Texas Tech University. (September 1, 1970 - Present).
Worked up the ranks from Asst. Prof. to Assoc. Prof. to Professor
Teaching and administration

Associate Vice Provost for Academic Affairs, Texas Tech University. (September 1, 2008 -
August 31, 2014).
Responsible for coordinating and assessing the university core curriculum and led
development of a new core curriculum, supervised 3 commencement exercises each year,
Office of the Provost liaison with the Graduate Council, edited student affairs pages of
university catalog each year, supervised production of commencement program, work with
colleges and departments developing new academic programs or modifying existing
programs.

Leadership Awards and Honors

Faculty Distinguished Leadership Award, Texas Tech University Parents Association. (April 18,
2015).

TEACHING

Courses Taught

Texas Tech University
3300, Honors Seminar in Fine Arts (Mexico through Its Cinema, 1 course.
3302, Honors Seminar in Science (Science and Society), 1 course.
GEOG 1401, Physical Geography Lab-Honors, 2 courses.
GEOG 2300, Introduction to Human Geography: Honors First Year Experience, 5 courses.
GEOG 2351, Regional Geography of the World, 1 course.
GEOG 3360, Technology and the Human Landscape, 1 course.
GEOG 4300, Seminar in Geography, 2 courses.
GEOG 4305, NAFTA, Western Hemisphere Trade, and Regional Integration in the Americas, 2 courses.
GEOG 4324, Geography of Health, 1 course.
GEOG 4369, Independent Research in Geography, 2 courses.
GEOG 5303, Advanced Human Geography, 1 course.
GEOG 5307, NAFTA, Western Hemisphere Trade, and Regional Integration in the Americas, 1 course.
GEOG 5310, Readings in Geography, 3 courses.
GEOG 5312, Seminar in Geographic Thought, 1 course.
GEOG 5320, Special Topics in Geography, 1 course.
GEOG 6000, Master's Thesis, 3 courses.
GEOG 7000, Research, 2 courses.
HONS 1303, Honors Seminar in Social Sciences: Geography, History, Culture, and Conflict, 1 course.
HONS 2314, Honors Seminar in International Cinema: Latin American Cinema-Honors, 5 courses.
HONS 2406, Honors Integrated Science II: Honors First Year Experience, 2 courses.
HONS 4300, Individual Honors Research, 1 course.
HUM 4100, Humanities Capstone, 1 course.

Non-Credit Instruction

Continuing Education, TTU Osher Lifelong Learning, 30 participants. (November 10, 2014).

Directed Student Learning


Isaac Colmanero, Master's Thesis Committee Chair, "Diffusion of Cumbia," Geosciences. (October 2014 - Present).


Caitlin Grann, Master's Thesis Committee Chair, "Exploring the Character of Place in Lubbock through Interviews, Mental Maps, and the Place Histories of Local Musicians," Geosciences. (December 2011 - April 5, 2013).

Teaching Awards and Honors

Outstanding Professor, TTU Chapter of Mortar Board. (November 15, 2009).

RESEARCH

Published Intellectual Contributions

Book, Chapter in Scholarly Book-New

**Conference Proceeding**


**Edited volume in special publications series**


**Film review**


**Invited review of book**


**Journal Article, Academic Journal**


**Presentations Given**


Elbow, G., West Texas Assessment Conference, "Assessment and Reform of the Texas Tech University Core Curriculum,," Texas Tech University Office of Planning & Assessment, Lubbock, TX. (October 16, 2012).


Elbow, G. (Presenter & Author), Paton, V., 10th Annual Texas A&M University Assessment conference, "Involving Faculty in Restructuring a Core Curriculum At Texas Tech University," Texas A&M University, College Station, TX. (February 22, 2010).


Intellectual Contributions in Submission

Essay

Elbow, G. *Innovation and the National Council for Geographic Education*. San Marcos, TX: Journal of Research in Geographic Education.

This is an extensive revision of a chapter from a book originally published in 1999. Mine is one of two chapters from the old book that will appear in the new one.


Research Interests

true, Latin American urban geography, ethnicity, cultural geography, geographic education

SERVICE

University Service

Committee Member, Integrated Humanities Course Development Committee. (March 1, 2015 - Present).

Committee Member, Latin America task force for the Office of International Affairs. (October 2014 - Present).

Committee Member, Writing INTensive Committee. (January 1, 2014 - Present).

Committee Member, Writing Intensive-Communication INTensive Committee. (September 1, 2013 - Present).

Committee Member, Quality Enhancement Plan Proposal Development Committee. (December 2013 - November 2014).

Committee Member, Certification of Compliance Committee #3, undergraduate education. (March 2013 - November 2014).

Focus group member for strategic planning, Strategic Planning Focus Group, TTU Museum. (November 5, 2014 - November 19, 2014).

Committee Member, Academic Council. (September 2008 - August 2014).

Committee Member, Strategic Planning Council Working Group on Enrollment and Student Success. (November 2011 - May 2014).

Liaison from Office of Provost to committee., Convocations Committee. (September 2009 - May 2014).
Committee Member, Quality Enhancement Plan Topic Selection Committee. (October 2013 - December 2013).

Committee Member, ICASALS Advisory Board. (December 2009 - August 2012).

Committee Member, Graduate Council. (September 2009 - August 2012).

Committee Member, Teaching Academy Executive Committee. (September 2009 - August 2012).

Committee Member, Summer Reading Committee. (October 2008 - May 2012).

Committee Chair, Core Curriculum Committee. (September 2008 - May 2012).

Chairperson, TU Fulbright Committee. (September 1999 - January 2011).

Committee Member, Seville Center Advisory Committee. (September 2005 - August 2010).

Committee Chair, Texas Tech University Fulbright Award Review Committee. (September 1998 - August 2010).

Committee Member, Quality Enhancement Plan Steering Committee. (January 1, 2005 - June 2010).

Committee Member, Seville Center Advisory Committee. (September 2005 - May 2010).

Committee Member, Ad Hoc Honorary Degree Advisory Committee. (November 19, 2009 - December 2009).

College Service

Honors College representative on council, Distance Learning Council. (September 2011 - Present).

Committee Member, Arts & Sciences Committee for Academic Programs. (September 1, 2014 - December 15, 2014).

Committee Member, Ethics Center Advisory Board (Honors College representative). (September 2010 - August 2013).

Committee Member, Graduate Council. (September 2009 - August 2012).

Department Service

Faculty Advisor, Geography MS student advisor (not on the dropdown list). (August 2015 - Present).

Faculty Advisor, Honors College undergraduate thesis advisor. (October 2014 - August 2015).

Committee Member, Arts and Sciences Committee for Academic Programs. (August 2014 - December 2014).

Committee Member, Ad Hoc Committee to Revise Tenure and Promotion Policy for Geosciences Department. (March 2013 - May 2013).
Committee Member, Tenure Probationary Faculty Third Year Review. (December 2009 - February 2010).

Professional Service

Board member, Texas state-wide higher education association, LEAP Texas, Arlington, TX. (January 1, 2014 - Present).

Chairperson, College Board, Social Science CLEP Exam Committee, Princeton, New Jersey. (May 15, 2009 - Present).

Committee Member, National Council for Geographic Education, Washington, DC. (September 1, 1991 - Present).


Committee Member, Texas Higher Education Coordinating Board, Austin, TX. (July 25, 2014 - July 31, 2014).


Reviewer, Ad Hoc Reviewer, Oklahoma State University, Department of Geography, Stillwater, Oklahoma. (October 20, 2013 - October 22, 2013).


Reviewed faculty credentials for promotion to professor, University of Colorado at Colorado Springs Department of Geography and Environmental Studies, Colorado Springs, CO. (September 30, 2012 - October 12, 2012).


Editor, Associate Editor, Conference of Latin Americanist Geographers, Austin, TX. (January 1, 2006 - January 2011).

Public Service

Board Member, Osher Lifelong Learning Institute, Lubbock, TX. (January 1, 2015 - Present).
Board Member, LEAP Texas, na, Texas. (May 2014 - Present).

**Service/Performance Partnerships**

College Board, CLEP History/Social Science Examination Review Committee, Technical or Expert Assistance, I served on a five-member committee to write and review examination questions and provide advice to College Board for the History/Social Science CLEP examination.

GEOG 2300, HS1, Human Geography, a service-learning course, Service Learning, GEOG 2300 is an introductory human geography course that enrolls Honors College students in their first semester. The course is structured around questions related to human well-being at different scales. Students provide a minimum of 20 hours of volunteer service with organizations that provide service to homeless individuals during the semester.

**Service Awards and Honors**

**Service, Professional**

George J. Miller Award for Distinguished Service, National Council for Geographic Education. (September 22, 2009).

**GENERAL**

**Consulting**

Non-Governmental Organization (NGO), College Board, Princeton, NJ. (June 2009 - December 2015).

**Professional Memberships**


Association of American Geographers. (September 1964 - Present).

Vice President for Publications and Products (1997-99), National Council for Geographic Education. (September 1964 - Present).
Education and Post Graduate Training

Ph D, Scripps Institution of Oceanography, University of California San Diego, 1995.
  Major: Geophysics
  Dissertation Title: Receiver function investigation of the upper mantle transition zone using receiver functions

MS, University of Texas at El Paso, 1987.
  Major: Geophysics
  Dissertation Title: Seismic investigation of the northern margin of the Gulf of Mexico

BS, University of Texas at El Paso, 1984.
  Major: Geophysics

Academic and Professional Experience

Associate Professor, Texas Tech University. (September 1, 2001 - Present).

TEACHING

Courses Taught

Texas Tech University
  2333, Intro to Geophysics, 1 course.
  5221, Adv. Seismic Exploration Methods, 1 course.
  GEOL 1101, Physical Geology Laboratory, 31 courses.
  GEOL 1303, Physical Geology, 6 courses.
  GEOL 3310, Quantitative Methods in Geology, 2 courses.
  GEOL 4001, Problems in Geosciences, 4 courses.
  GEOL 4300, Independent Studies in Geology, 2 courses.
  GEOL 4312, Undergraduate Research, 11 courses.
  GEOL 5001, Problems in Geosciences: Mantle Geodynamics, 3 courses.
  GEOL 5300, Individual Studies in Geology, 4 courses.
  GEOL 5310, Advanced Quantitative Methods in Geology, 1 course.
  GEOL 6000, Master's Thesis, 22 courses.
  GEOL 7000, Research, 19 courses.
  GEOL 8000, Doctor's Dissertation, 4 courses.
  GPH 2333, Introduction to Geophysics, 1 course.
  GPH 3310, Introduction to Geophysical Data Processing, 3 courses.
  GPH 4300, Independent Studies in Geophysics, 2 courses.
  GPH 4321, Seismic Exploration Methods, 8 courses.
  GPH 4323, Potential Field and Electromagnetic Methods in Geophysics, 9 courses.
  GPH 5223, Advanced Applied Electrical Methods, 2 courses.
  GPH 5300, Passive Seismic Methods, 5 courses.
  GPH 5303, Seismic Data Analysis, 1 course.
  GPH 5305, Velocity Model Building, 1 course.
  GPH 5321, Advanced Seismic Exploration Methods, 8 courses.
GPH 5323, Advanced Potential Field and Electromagnetic Methods in Geophysics, 6 courses.
GPH 5330, Geophysical Data Processing, 3 courses.
PHYS 6000, Master's Thesis, 2 courses.
PHYS 7000, Research, 2 courses.

**Directed Student Learning**


Attiya Darrensberg, Master's Thesis Committee Chair, "Investigation of the upper mantle discontinuities by modeling PP and SS bouncepoint precursors," Geosciences. (January 2015 - Present).

Allyasi Ainiwaer, Dissertation Committee Chair, "Investigation to isolate Ps phases and reverberations in reflections data to improve the stacking of Ps data," Geosciences. (September 2014 - Present).

Matthew Lewis, Master's Thesis Committee Chair, "Using fractal dimensions to pick formation tops in well log data," Geosciences. (September 2014 - Present).

Tyler Goodell, Master's Thesis Committee Chair, "Wave form modeling of PP and SS phases to estimate crustal structure," Geosciences. (September 2014 - Present).

Derrick Lawerence, Undergraduate Research, "Investigation to determine if saturation of a Playa lake can be monitored with a relative gravity meter," Geosciences. (September 2014 - Present).

Kenney Rogers, Dissertation Committee Chair, "Investigation to estimate travel times in noise Ps data and preform Ps tomography," Geosciences. (January 2014 - Present).


Alec Dotzer, Master's Thesis Committee Chair, "Mantle Transition Zone Variations Across Central South America," Geosciences. (September 2013 - December 2015).


Allyasi Ainiwaer, Master's Thesis Committee Chair, "Waveform analysis of amplitude and frequency content of the P410P phases from common upper mantle discontinuities," Physics. (September 2012 - December 2014).


Nick Talavera, Undergraduate Research, "Vertical component receiver function Imaging of the Matador arch," Geosciences. (September 2013 - May 2014).
Ali Eroglu, Master's Thesis Committee Chair, "Characterization of active and passive sources for frequency content and image quality," Geosciences. (January 2012 - May 2014).


Luchen Li, Master's Thesis Committee Chair, "Investigating Moho structure in Basin and Range area and Colorado Plateau using Receiver Functions," Geosciences. (September 2011 - August 2013).

Mark Knuppel, Master's Thesis Committee Chair, "Ps receiver functions and Vp/Vs modeling of the Texas Gulf Coast," Geosciences. (September 2011 - August 2013).

Xinwei Huang, Master's Thesis Committee Chair, "Uncertainty Analysis of P-wave Receiver Functions.," Geosciences. (September 2011 - August 2013).

Kenney Rogers, Master's Thesis Committee Chair, "Investigation of the upper mantle beneath the Hawaiian Island chain using PP-precursors.," Geosciences. (September 2010 - August 2013).

Jefferey Poole, Undergraduate Research, "Receiver function investigation of the Texas Big Bend Area," Geosciences. (January 2013 - May 2013).

Sarah Wilson, Undergraduate Research, "Investigation of focal mechanism of Earthquakes at Snyder, TX," Geosciences. (September 2012 - May 2013).


Matthew Tave, Master's Thesis Committee Chair, "Imaging of the Crust and Moho beneath Oklahoma using Receiver Functions and Pn Tomography; with Emphasis on the Southern Oklahoma Aulacogen," Geosciences. (September 2011 - May 2013).

Thomas Harrington, Master's Thesis Committee Chair, "Geophysical investigation of the post Grenville Orogen lithosphere Texas Gulf Coast.," Geosciences. (September 2011 - May 2013).

Olusola Oluwole, Master's Thesis Committee Chair, "Investigation of lineaments on the high plains and the matador arch using gravity and seismic data," Geosciences. (January 2009 - May 2013).

Clyde Barbian, Undergraduate Research, "Receiver function study of the salton trough of Southern California," Geosciences. (September 2012 - December 2012).


Fang Yuan, Master's Thesis Committee Chair, "P-wave Deformable Layer Tomography for Crustal Structure of Salton Trough," Geosciences. (September 2011 - December 2012).

Crystal Pate, Master's Thesis Committee Chair, "Spatial analysis of FMA logs to determine lithofacies," Geosciences. (September 2010 - August 2012).
Greg Duncan, Master's Thesis Committee Chair, "Processing innovations to improve PP precursor analysis and increase frequency content of studies in the Mid-Pacific," Geosciences. (September 2010 - August 2012).

Kevin Pratt, Master's Thesis Committee Chair, "Common conversion point imaging of the western United States: Improved methods for receiver function stacks," Geosciences. (September 2010 - August 2012).


Zhuhui Zou, Dissertation Committee Member, "A seismological study of the Three-Gorges Reservoir (TGR)," Geosciences. (September 2010 - May 2012).


Olabisi Ajiboye, Master's Thesis Committee Member, Geosciences. (September 2010 - May 2011).


Matthew Mcswain, Undergraduate Research, "Investigation of turns in a stream channel and tributary azimuths in the high plains of Texas," Geosciences. (January 2009 - December 2010).

Kevin Pratt, Undergraduate Research, "Bean forming of seismograms to produce 3-component receiver functions," Geosciences. (May 2010).


Shanna Brown, Master's Thesis Committee Chair, "3-D receiver function study of the upper mantle beneath Northern California.," Geosciences. (September 2005 - December 2009).

RESEARCH

Published Intellectual Contributions

Abstract


Knuppel, M., Gurrola, H. (2012). *Receiver function analysis of the Texas Gulf Coast to better understand the Ouachita Orogeny, opening of the Gulf of Mexico, and current state of the southern margin of North America*. EOS.


Gurrola, H., Pratt, K., Pulliam, J., Dunbar, J. (2011). *Preliminary results of receiver function analysis of seismic data recorded from a broadband deployment across the Gulf Coast Plain*. EOS.


Gurrola, H., Pratt, K., Pulliam, J. (2011). *Processing innovations necessary to maximize resolution of models of the northern Gulf Coast Plain using data from the “GUMBO” seismic study* (3rd ed., vol. 43, pp. 37). Geological Society of America, South-Central Section, 45th annual meeting; abstracts with programs.


**Journal Article, Academic Journal**


Presentations Given


Gurrola, H. (Presenter & Author), Pratt, K. (Author Only), Pulliam, J. (Author Only), Dunbar, J. (Author Only), Annual meeting of the American Geophysical Union, "Preliminary results of receiver function analysis of seismic data recorded from a broadband deployment across the Gulf Coast Plain," American Geophysical Union, San Francisco. (December 2011).


Gurrola, H. (Presenter & Author), Pulliam, J. (Author Only), Pratt, K. (Author Only), Dunbar, J. (Author Only), South Central Section Meeting of the Geological Society of America, "Processing innovations necessary to maximize resolution of models of the northern Gulf Coast Plain using data from the "GUMBO" seismic study," Geological Society of America, New Orleans. (March 2011).


Contracts, Grants and Sponsored Research

Contract


Grant


Gurrola, H. (Co-Principal), Pulliam, J. (Principal), Dunbar, J. (Co-Principal), "Deep seismic investigation of a rifted margin: Gulf of Mexico to the Llano Uplift, Central Texas," Sponsored by ARP/ATP, State, $75,000.00. (July 2010 - August 2013).


Research in Progress

"Imaging the Earth using PP precursors" (On-Going).
I have several students using this method to image the lithosphere in different parts of the Earth. We are processing these data at unprecedented frequency content and are imaging features beneath the pacific ocean previously not imaged. There will be enough data using this processing to keep many graduate students working.

"Imaging the high plains 3-D structure with broad band seismic stations." (On-Going).
We started a deployment of the seismometers across the Matador arch. We will keep them in a tight array to improve stacking quality and frequency content. We plan to keep rolling these stations for a few years to provide data for both graduate and undergraduate work.

SERVICE

Department Service

Committee Chair, Apace committee. (January 2014 - Present).
Committee Member, Undergraduate. (January 2009 - Present).

Professional Service

Reviewer, Grant Proposal. (September 2014).
Reviewer, Journal Article, Seismological Society of America. (September 2014).

GENERAL

Professional Memberships

American Geophysical Union. (1988 - 2010).
Education and Post Graduate Training

Postdoctoral, University of Massachusetts, Amherst, 2006.
Major: Geology

Major: Geology

Ph D, University of Basel, 2001.
Major: Mineralogy
Supporting Areas of Emphasis: Petrology and Geochemistry
Dissertation Title: Barium anomalies in the Berisal Complex, Simplon Region, Switzerland: A study in mineralogy, petrology and geochemistry

Major: Geochemistry
Dissertation Title: Mapping and geochemical studies of the Moshaneng Complex, Moshaneng, Botswana.

Academic and Professional Experience

Associate Professor, Texas Tech University. (September 1, 2014 - Present).

Assistant Professor, Texas Tech University. (August 2008 - Present).

Adjunct Professor (Research), University of Massachusetts, Amherst. (January 1, 2007 - December 31, 2010).

TEACHING

Courses Taught

Texas Tech University
- GCH 4308, Techniques and Applications in Mineral Sciences, 1 course.
- GCH 5300, Diagenesis & low-T Metamorphism, 2 courses.
- GCH 5308, Techniques and Applications in Mineral Sciences, 1 course.
- GEOL 1101, Physical Geology Laboratory, 37 courses.
- GEOL 1303, Physical Geology, 3 courses.
- GEOL 2303, Earth Materials, 8 courses.
- GEOL 2403, Earth Materials, 4 courses.
- GEOL 3401, Mineralogy and Petrology, 12 courses.
- GEOL 4300, Independent Studies in Geology, 4 courses.
- GEOL 4312, Undergraduate Research, 11 courses.
- GEOL 5101, Seminar, 2 courses.
GEOL 5300, Individual Studies in Geology: Advanced Metamorphic Petrology, 7 courses.
GEOL 5304, Techniques in Electron Microscopy and Microanalysis, 2 courses.
GEOL 6000, Master's Thesis, 16 courses.
GEOL 7000, Research, 16 courses.
GEOL 8000, Doctor's Dissertation, 5 courses.

Non-Credit Instruction

Summer I Course in Advanced Techniques in Scanning Electron Microscopy, 13 participants.
(June 1, 2013 - July 2, 2013).

Directed Student Learning

Danielle Keathley, Master's Thesis Committee Chair, "Constraining the geotectonic environment of Seland Igneous Complex emplacement, Northern Norway.,” Geosciences. (August 2015 - Present).

Hepeng Tian, Master's Thesis Committee Member, "Magma processes in a lobe of the Tuolene Intrusive Complex," Geosciences. (August 2015 - Present).

Matt Fisher, Master's Thesis Committee Chair, "A comparative study for the application of compositional analyses to unconventional hydrocarbon reservoir rocks," Geosciences. (January 2015 - Present).

Jordan Arnold, Undergraduate Research, "Reaction textures in carbonatite carbonate minerals and their trace element signatures," Geosciences. (January 2015 - Present).

Michael Scott Clarke, Undergraduate Research, "Trace element signatures in feldspars as a monitor of partial melting processes," Geosciences. (January 2015 - Present).

Kaushik Das, Qualifying Exam Committee Member, Mechanical Engineering. (December 2014 - Present).


Jeremy Deans, Dissertation Committee Member, "Deformation in oceanic crust," Geosciences. (August 2010 - Present).

Samantha Buck, Master's Thesis Committee Member, "Xenolith petrology in the Wooly Creek batholith," Geosciences. (December 1, 2009 - Present).


Ethan Backus, Master's Thesis Committee Chair, "Integration of monazite geochronology and

David Brannan, Master's Thesis Committee Member, "Quartz grain surface textures as proxy for

Hollee Baird, Master's Thesis Committee Member, "Geochemical proxies for climate change and

Rachel Weiss, Master's Thesis Committee Member, "Correlating magma sources in the Rogue-
Chetco Complexes, Josephine Ophiolite and Greyback Pluton," Geosciences. (August 2012 -
December 2014).

Alexander Lozano, Undergraduate Research, "Tracking mica abundances in metamorphic rocks

Deborah Drennan, Undergraduate Research, "Reconciling U-abundances with mineralogy in

Jacob Cobb, Undergraduate Research, "Whole-rock compositional analysis of pelites from the
thermal aureole of the Ballachulisch Igneous Complex," Geosciences. (August 2013 - May
2014).

Samiha Morsey, Dissertation Committee Member, "Impact of HCl flushing on the properties of

Jennifer Riedel, Master's Thesis Committee Member, "Mn-mineral oxidation states,"
Geosciences. (November 2012 - May 2014).

Trudy Watkins, Undergraduate Research, "Quartz preferred orientation in deformed quartzite and

Stanley Hensley, Master's Thesis Committee Chair, "Accessory mineral assemblages in the
thermal aureole of the Ballachulisch Igneous Complex," Geosciences. (August 15, 2011 -
April 2014).

Alexander Gonzales, Undergraduate Research, "Impact of HCl treatment to the mineralogy and

Jacob Leader, Master's Thesis Committee Member, "Preferred orientation of opaque phases in

Ryan Berry, Undergraduate Research, "Tracking parental magma compositions through trace

Brian Crass, Undergraduate Research, "Mineralogical versus sorption hosts for U anomalies in

Jordan Dyer, Undergraduate Research, "Whole rock compositional analysis of meta-volcanics
from the Rouge Formation, Oregon," Geosciences. (September 2012 - May 2013).

Brandon Nally, Undergraduate Research, "Application to XRD to identifying pedogenic and non-
pedogenic sediments in the Pennsylvanian-Permian Fountain Formation," Geosciences.
(January 2012 - December 2012).


Nolwenn Coint, Dissertation Committee Member, "Linking extrusive and intrusive magmatism in the Wooly Creek batholith," Geosciences. (October 1, 2008 - May 2012).


Jeff Oalmann, Master's Thesis Committee Member, "Mid-crustal rocks from mid-Norway," Geosciences. (January 1, 2009 - August 1, 2010).

Jian Zhou, Doctoral Advisory Committee Member, "Aqueous geochemistry at a superfund site," Geosciences. (October 1, 2008 - August 1, 2010).

Jeremy Deans, Master's Thesis Committee Member, "CL and Trace elements of quartz at Harrison Pass," Geosciences. (October 1, 2008 - August 1, 2010).


**RESEARCH**

**Published Intellectual Contributions**

**Conference Proceeding**


Journal Article, Academic Journal


**Journal Article, Professional Journal**


**Presentations Given**


Backus, E. (Presenter & Author), Garnett, M. (Author Only), Hetherington, C. (Author Only), Geological Society of America Southeastern Section Annual Meeting, "Quantifying the role of fluid as related to melt movement in the Chaotic Zone of the Thermal Aureole of the Ballachulish Igneous Complex, Scotland.," Geological Society of America, Chattanooga, TN. (March 19, 2015).


Hetherington, C., Husdal, T., GAC-MAC Joint Meeting, "400 Ma dates in a rare element NYF-pegmatite from Stetind, Nordland, Norway: Recrystallized Proterozoic assemblages or A-type pegmatite-emplacement in overly-thickened crust at a continental margin?," Geological Association Canada and Mineralogical Association Canada, Winnipeg. (May 2013).


Moore, L. M. (Presenter & Author), Hetherington, C. (Author Only), South West Section AAPG Annual Meeting, "Cation charge controls on calcite crystal size and morphology: potential impact on reservoir rock cementation, porosity and permeability," AAPG, Forth Worth, TX. (May 2012).


Gonzales, A. (Presenter & Author), Hetherington, C. (Author Only), The 2013 AAPG Southwest Section Meeting, "Quantifying the Mineralogical and Compositional Response of Shale Oil and Gas Rocks to Matrix Acidification," AAPG, Fredericksburg, TX. (April 2012).

Hetherington, C., Tectonics Study Group, "The multi-stage history of magma production and emplacement in the crustal column beneath the Ruby Mountains-East Humboldt Range metamorphic core complex, Nevada,," Univeristy California Santa Barbara - Earth Sciences, Santa Barbara, CA. (March 7, 2012).


Hetherington, C., Communicating with the Net Generation, "What is successful mentoring?" TTU TLPDC, TTU Campus, Lubbock. (October 19, 2011).


Ward, C. A. (Presenter & Author), Hetherington, C., Joint Rocky Mountain - Cordillerian Section Meeting, "Greenstone rocks in the Mimbres valley, central New Mexico: geological


Hetherington, C., Shell Seminar Series, "From detritus to diagenesis: the role of accessory phase assemblages and textures in provenance studies," University of Oklahoma, School of Energy, Norman, OK. (December 2010).


Contracts, Grants and Sponsored Research

Grant

Barnes, C. G. (Principal), Hetherington, C. (Co-Principal), Yoshinobu, A. (Co-Principal), Sylvester, P. (Co-Principal), "Subcretion versus relamination: testing processes of lower crustal modification in the Klamath Mountain accretionary province," Sponsored by NSF, Texas Tech University, $350,001.00. (June 1, 2016 - May 31, 2019).


Hetherington, C. (Principal), "Trace element mobility in the sub-solidus: Accessory mineral stability, fluids and the role of the rock," Sponsored by Texas Tech University, Federal, $184,159.00. (July 2011 - June 2014).

Intellectual Contributions in Submission

Journal Article, Professional Journal

Romanoski, A., Coint, N., Hetherington, C., Cottle, J. M., Barnes, C. G. The Impact of Chemical Abrasion on Trace Element, U-Pb, and Oxygen Isotope Analysis of Zircon by In Situ Micro-Analytical Techniques. Chemical Geology.
Research in Progress

"Constraining the timing and rates of magma production in the Ruby Mountain - East Humboldt Range Metamorphic Core Complex" (On-Going).

"Evolving mineralogies in I, or are they A-, type pegmatites" (On-Going).

"Geochemistry and mineralogy of black-shale type rocks in North America" (Planning).

"Linking intrusive and extrusive magmatism in the Rouge and Chetco Complexes, Klamath Mountains" (On-Going).

"The Evolution of Sediment Provenance through the Upper Paleozoic Succession of Texas: Implications for the Tectonic Evolution of the Ouachita Orogen" (Complete). This study uses detrital zircon geochronometry and accessory mineral geochemistry to ascertain the source terrains for sediment filling the Fort Worth and Midland Basins of Texas. Preliminary results indicate Permian sediments of central Texas were derived from Gondwana and not North America, significantly altering established models for the nature of the collision between Gondwana and North America.

"Radiation Damage Effects on the Hardness of Zircon" (On-Going). (2013 - Present). The use of indentation techniques is made to measure the surface hardness of radiation damaged minerals.

"Constructing a compositional database compositions for North American cherts" (Planning). (June 2014).

Research Interests

true, Mineralogy and its applications to petrology, geochemistry and geochronology

SERVICE

University Service

Committee Member, Radiation Safety Committee. (January 1, 2010 - Present).

Committee Member, Bicycle Coordinating Committee. (January 2009 - December 2015).

Committee Member, Center for Undergraduate Research Advisory Committee. (August 2010 - May 2013).

College Service

Faculty Director, College Electron Microscopy Facility. (January 2014 - Present).

Committee Member, Materials Characterization Facilities Task Force. (September 2010 - May 2012).
**Department Service**

Committee Chair, Graduate Committee. (August 2013 - Present).
Committee Member, Graduate Committee. (January 1, 2009 - Present).
Committee Chair, Electron Microscopy Applications Scientist. (January 2014 - July 2014).
Committee Chair, Department Research Day. (January 2008 - May 2014).

**Professional Service**

Editor, Associate Editor, The American Mineralogist. (January 2014 - Present).
Distinguish Lecturer Selection Committee Member, Mineralogical Society of America. (October 2012 - Present).
Session Chair, Geological Society of America. (January 2015 - November 2015).
Special Issue Associate Editor, American Mineralogist/Min. Soc of America. (December 2011 - December 2014).
Session Chair, Geological Society of America, Austin, Texas. (September 2012 - April 2013).
Session Chair, Geological Society of America, Carlotte, South Carolina. (February 2012 - October 2012).
Session Chair, Geological Society of America, Minneapolis, Minnesota. (February 2011 - October 2011).

**Service/Performance Partnerships**

Special Session on the Tectonic Applications of Monazite, Engaged Research and Creative Activity. After an explosion of initial interest in the use of micro-analytical techniques to the petrographic applications of accessory minerals ~10 years ago the science of the subject has reached a natural hiatus. A special session at an international scientific conference was convened that invited many of the leading researchers in the field to present and review the current status of the science. The invited speaker list included established figures and a slate of early-career scientists who are expected to define the direction of the topic in the next 10 years. The session led to an invitation to guest edit a special issue in a top-ranking peer-reviewed scientific journal published by one of the World's foremost learned societies, the Mineralogical Society of America. The special issue will be published in a new 'Special Collections' format where both historical and future articles of relevance and importance to the topic will be collated in one electronic platform.

**Service Awards and Honors**

Service, University
Outstanding Faculty Mentor 2011, Center for Undergraduate Research, Texas Tech University. (April 2011).

GENERAL

Professional Memberships

Edinburgh Geological Society.

Fellow, Geological Society of London.

Mineralogical Association of Canada.

Mineralogical Society of America.

Swiss Society of Mineralogy and Petrology.

American Geophysical Union. (January 2014).

Sigma Xi. (November 2010 - December 2012).

Development Activities Attended


Workshop, "Summit on Future of Undergraduate Education in the Geosciences," National Science Foundation, Austin, TX, USA. (January 10, 2014 - January 12, 2014).


Workshop, "If They Write It, I Have to Grade It! Evaluating Student Writing," TTU Teaching, Learning and Professional Development Center, Lubbock, TX. (September 19, 2011).

Workshop, "The Many Hats We Wear," TTU Teaching, Learning and Technology Center, Lubbock, TX. (August 18, 2011).

Workshop, "Building and Exemplary On-Line Course," TTU Teaching, Learning and Technology Center, Lubbock. (April 21, 2010).
Professor Juske Horita  
Texas Tech University  
(806) 834-7027  
juske.horita@ttu.edu

Education and Post Graduate Training

Ph D, Tokyo Institute of Technology, 1987.  
Major: Geochemistry

Academic and Professional Experience

Senior R&D Scientist, Oak Ridge National Laboratory. (August 30, 2010).

TEACHING

Courses Taught

Texas Tech University
GCH 5300, Indiv Stds In Geochem: Isotope Geochemistry, 1 course.
GCH 5350, Isotope Geochemistry, 5 courses.
GEOL 1101, Physical Geology Laboratory, 42 courses.
GEOL 4312, Undergraduate Research, 2 courses.
GEOL 5001, Special Topics in Geophysics, 1 course.
GEOL 5300, Individual Studies in Geology: Petroleum Geochemistry, 4 courses.
GEOL 6000, Master's Thesis, 7 courses.
GEOL 7000, Research, 13 courses.
GEOL 8000, Doctor's Dissertation, 2 courses.

Directed Student Learning

Heather Williams, Master's Thesis Committee Member, Geosciences. (August 2015 - Present).
Maeghan Brundrett, Dissertation Committee Member, Civil & Environmental Engineering.  
(October 2014 - Present).
Charlie Keracik, Master's Thesis Committee Chair, Geosciences. (August 2014 - Present).
Yanlai Han, Dissertation Committee Member, Civil & Environmental Engineering. (May 2014 - Present).
Chenhui Li, Dissertation Committee Member, Plant & Soil Science. (April 2014 - Present).
Kyle Falk, Master's Thesis Committee Chair, Geosciences. (August 2013 - Present).
Changjie Liu, Dissertation Committee Chair, Geosciences. (January 2013 - Present).
Sankar Sasidharan, Dissertation Committee Member, Geosciences. (August 2013 - December 2015).
Ushio Kawai, Dissertation Committee Member, Natural Resources Management. (January 2011 - November 2015).

Jared Stoffel, Master's Thesis Committee Member, Geosciences. (January 2012 - December 2013).

Jennifer Reidel, Master's Thesis Committee Member, Geosciences. (January 2012 - December 2013).

Jessica Quintanilla, Master's Thesis Committee Chair, Geosciences. (September 1, 2011 - December 31, 2013).

Anthony Romanoski, Master's Thesis Committee Member, Geosciences. (January 2011 - December 2012).

RESEARCH

Published Intellectual Contributions

Abstract


Journal Article, Academic Journal


**Presentations Given**


Falk, K. (Presenter & Author), Horita, J. (Author Only), Geological Society of America South-Central, "Assessing the Occurrence and Sources of Natural Gases in Groundwater from the Southern High Plains, West Texas." (March 2015).


Kucera, J. (Presenter & Author), Acosta-Martinez, V. (Author Only), Zak, J. (Author Only), Horita, J. (Author Only), USDA-AFRI- Annual Meeting, "Soil Microbial Communities: key Indicators of Soil Carbon Transformation When Conservation Reserve Program Land is Converted to Cropland," USDA, Washington, DC. (June 2013).

Quintanilla, J. (Presenter & Author), Horita, J. (Author Only), Rainwater, K. (Author Only), Geological Society of America Southcentral meeting, "Hydrogeochemical study of urban man-made lakes (Jim Bertram Lake System) in Lubbock, Texas." (April 2013).


Contracts, Grants and Sponsored Research

Contract

Horita, J. (Principal), Holterhoff, P. (Co-Principal), "Planning, Execution and Data Analysis of Neutron Imaging Experiments," Sponsored by DOE/Oak Ridge National Laboratory, Federal, $24,000.00. (October 1, 2010 - September 30, 2011).

Grant

Kucera, J. (Principal), Horita, J. (Co-Principal), Hudnall, W. (Co-Principal), Zak, J. (Co-Principal), "Soil Microbial Communities: Key Indicators of Soil Carbon Transformations When Conservation Reserve Program Land is Converted to Cropland," Sponsored by USDA-AFRI, Federal, $480,000.00.


Horita, J. (Principal), "Site-Specific Isotope Fractionation of Hydrocarbons by Quantitative NMR Spectroscopy," Sponsored by American Chemical Society, Other, $100,000.00. (January 1, 2012 - August 31, 2015).


**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**

Han, Y., Liu, C., Horita, J., Yan, W. Trichloroethene Hydrodechlorination by Pd-Fe Bimetallic Nanoparticles: Solute-induced Catalyst Deactivation Analyzed by Carbon Isotope Fractionation. *Applied Catalysis B: Environmental*.

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**SERVICE**

**University Service**

Attendee, Meeting, TTU Climate Science Center. (December 2011 - Present).

Attendee, Meeting, Hydraulic fracking group. (October 2011 - Present).

Attendee, Meeting, TTU Water Summit. (July 2014).

Committee Member, Cluster Hire for water initiative. (2013).

Attendee, Meeting, Focus group meeting for VPR search. (April 2013 - 2013).

Grant Proposal Reviewer, Internal, VPR Proposal Stimulus Program. (July 2013 - 2013).

Committee Member, BL Allen endowed chair position search committee for Soil-Plant Sciecne Dept. (October 2012 - 2013).

Attendee, Meeting, Transdisciplinary Academy. (December 2011 - December 2012).

Committee Member, Faculty search committee for Soil-Plant Sciecne Dept. (April 2012 - July 2012).

Attendee, Meeting, TTU Water Summit. (June 2012).

**College Service**

Attendee, Meeting, Graduate Dean's representative (Mcgovern, Chemistry). (April 2013 - 2013).

**Department Service**

Committee Chair, Award Committee. (August 2015 - Present).

Committee Member, Graduate Committee. (April 1, 2011 - Present).

Committee Member, Search committee for Imaging Center Research Associate. (March 2014 - May 2014).

Committee Chair, 3rd-year review of Dr. Ancell. (January 2013 - March 2013).
Committee Chair, 3rd-year review of Dr. Bruning. (January 2013 - March 2013).
Committee Chair, 3rd-year review of Dr. Kang. (January 2013 - March 2013).
Committee Member, Search Committee of Atmospheric position. (October 2012 - March 2013).

**Professional Service**

Committee Member, Science Review Committee, Oak Ridge National Laboratory's Neutron Sciences Directorate. (2013 - Present).
Seminar presentation, University of Nantes, France. (June 4, 2015).
Seminar presentation, INSTITUT DE PHYSIQUE DU GLOBE DE PARIS, France. (June 3, 2015).
Committee Member, PhD committee for University of New Mexico, Albuquerque, NM. (August 2012 - December 2014).
Seminar presentation, University of Houston. (September 24, 2014 - September 25, 2014).
Committee Member, DOE/BES Program Review, Berkeley, CA. (March 2014).
Chairperson, “Advances in Low-Temperature and Isotope Geochemistry”, Geological Society of America annual meeting. (2012).
Seminar presentation, NASA/Johnson Space Center. (February 16, 2012 - February 17, 2012).
Attendee, Meeting, Playa Working Group meeting, Lubbock. (February 8, 2012).
Editor, Associate Editor, Geochimica Cosmochimica Acta. (2001 - January 2012).
Seminar Speaker, Sandia National Laboratory. (May 2011).

**GENERAL**

**Professional Memberships**

American Geophysical Union.
Geochemical Society of Japan.
Geological Society of America.
The Geochemical Society.
Dr. Song-Lak Kang  
Texas Tech University  
(806) 834-1139  
song-lak.kang@ttu.edu

Education and Post Graduate Training

Ph D, Pennsylvania State University, 2007.  
Major: Atmospheric Science  
Supporting Areas of Emphasis: Atmospheric Boundary Layer and Wind Power Forecast  
Dissertation Title: The effects of mesoscale surface heterogeneity in the fair-weather convective atmospheric boundary layer

MS, Yonsei University, 1998.  
Major: Meteorology  
Dissertation Title: A study of the radiative effects in an axisymmetric tropical cyclone model

BS, Yonsei University, 1992.  
Major: Meteorology

Academic and Professional Experience

Assistant Professor of Atmospheric Science Group, Texas Tech University. (September 1, 2010 - Present).

Scientific Visitor of Research Application Program, National Center for Atmospheric Research. (June 1, 2010 - August 13, 2010).  
Wind Farm Data Analysis

Postdoctoral Fellow of Advanced Study Program, National Center for Atmospheric Research. (February 1, 2008 - May 31, 2010).

Leadership Awards and Honors

TEACHING

Courses Taught

Texas Tech University  
ATMO 1100, Atmospheric Science Laboratory, 38 courses.  
ATMO 1300, Introduction to Atmospheric Science, 3 courses.  
ATMO 4300, Independent Studies in Atmospheric Science, 5 courses.  
ATMO 5301, Individual Studies in Atmospheric Science: Wind Power Meteorology, 2 courses.  
ATMO 5319, Boundary Layer Meteorology, 3 courses.  
ATMO 6000, Master's Thesis, 10 courses.  
ATMO 7000, Research, 18 courses.  
GEOL 4312, Undergraduate Research, 1 course.  
GEOL 8000, Doctor's Dissertation, 6 courses.  
GPH 5310, Geophysical Fluid Dynamics, 2 courses.  
IS 5000, Graduate Directed Studies, 1 course.
Non-Credit Instruction

ABL Team Meeting, 3 participants. (January 2013 - Present).

Weather Visualization Team Meeting, 4 participants. (January 2013 - May 2013).

ABL Team Meeting, 8 participants. (September 2011 - December 2011).

Directed Student Learning

Timothy Sliwinski, Dissertation Committee Chair. (January 2014 - Present).

Brock Burghardt, Dissertation Committee Member. (September 2013 - Present).

Laura Lenfest, Master's Thesis Committee Chair. (September 2013 - Present).

Hoon Ill Won, Dissertation Committee Chair, Wind Energy. (September 2012 - Present).

Aaron Hardin, Master's Thesis Committee Member. (September 2013 - August 2015).

Matt Lauridsen, Master's Thesis Committee Member, Atmospheric Science Group. (September 2013 - August 2015).

Christian Nauert, Master's Thesis Committee Member. (September 2012 - August 2015).

Richard Krupar, Dissertation Committee Member, Civil & Environmental Engineering. (January 2012 - August 2015).

Neha Marathe, Dissertation Committee Member, Civil & Environmental Engineering. (September 2012 - December 2014).

Paul Prososki, Master's Thesis Committee Member, Atmospheric Science Group. (September 1, 2011 - August 2014).


Timothy Cermark, Master's Thesis Committee Member, Atmospheric Science Group. (January 2013 - July 2014).

Richard Krupar, Qualifying Exam Committee Member, Wind Energy. (November 2013 - June 2014).

Everett Perry, Dissertation Committee Chair, Wind Energy. (September 2012 - December 2013).

Daniel Vecellio, Supervised Research, Atmospheric Science Group. (September 2012 - December 2013).


Christopher Bednarczyk, Master's Thesis Committee Member. (September 2011 - August 2013).
Vanna Chmielewski, Master's Thesis Committee Member, Atmospheric Science Group. (September 2011 - August 2013).


Dalton Walker, Undergraduate Research, Geosciences. (September 2012 - May 2013).


Neha Marathe, Qualifying Exam Committee Member, Civil & Environmental Engineering. (April 5, 2013).


Everett Perry, Qualifying Exam Member. (April 2012).


**RESEARCH**

**Published Intellectual Contributions**

**Book, Scholarly-New**


**Journal Article, Academic Journal**


**Presentations Given**

Kang, S.-I., Seminar, "Multi-scale Convective Boundary Layer induced by the surface flux heterogeneity," Pusan National University, Busan, South Korea. (November 21, 2014).


Choi, Y.-J. (Presenter Only), Kang, S.-I. (Author Only), Fall Meeting, "Effects of Mesoscale Surface Heterogeneity on Low-level Wind Fields," Korea Meteorological Society. (October 2014).


Sullivan, V. C. (Presenter & Author), Bruning, E. (Author Only), Kang, S.-I. (Author Only), 2012 Fall Meeting, "Observations of the vertical electric field on days with airborne dust in West Texas," American Geophysical Union, San Francisco, CA. (December 3, 2012).


Kang, S.-l. (Presenter & Author), Seminar of Physical and Life Sciences, "Heterogeneous Atmospheric Boundary Layer," Lawrence Livermore National Laboratory, Lawrence, CA. (April 2010).


Contracts, Grants and Sponsored Research

Grant


Kang, S.-l. (Principal), "Optimization of Turbulence and Multi-scale Module in the Urban Boundary Layer for Urban Meteorology Information," Sponsored by Hankuk University of Foreign Studies, South Korea, $114,031.00. (June 8, 2015 - December 31, 2015).


Kang, S.-l. (Principal), "Examining the Effectiveness of Wind Profiler Measurement for the WISE Observation Network," Sponsored by Korean Center for Atmospheric And Earthquake Research, Other, $28,000.00. (December 2013 - June 2015).

Intellectual Contributions in Submission

Journal Article, Academic Journal

**Research in Progress**

"Nacelle Anemometer Data Analysis“ (Complete). (September 2013 - December 2014).
Making a academic journal paper

**Research Interests**

true, Atmospheric Boundary Layer
Scale Interaction between Mesoscale and Turbulence
Wind Power Meteorology
Moist Convection Initiation and Development
Interaction between the land surface and atmosphere
Large Eddy Simulation
Numerical Weather Prediction

**SERVICE**

**University Service**

Reviewer, Undergraduate Research Conference. (April 1, 2015).
Poster Judge, Undergraduate Research Conference. (April 16, 2014).
Task Force Member, An Effort For Developing a NSF Water Sustainability and Climate (WSC) grant proposal. (January 2012 - August 2012).

**Department Service**

Committee Member, Search Committee (Sedimentary Structure). (January 2015 - March 31, 2015).
Poster Judge, Geosciences Research Day. (May 7, 2014).

**Professional Service**

Committee Member, WISE International Workshop, Seoul. (September 1, 2014 - November 19, 2014).


Reviewer, Journal Article, Weather and Forecasting. (October 2010 - November 2011).


GENERAL

Professional Memberships

American Geophysical Union. (December 2010 - Present).

American Meteorological Society. (July 2010 - Present).

Development Activities Attended


Workshop, "Research Orientation," TLTC-Texas Tech Univ., Lubbock, TX. (September 17, 2010).
Education and Post Graduate Training

Ph D, University of Chicago, 1988.
Major: Geochemistry
Supporting Areas of Emphasis: Mineralogy
Dissertation Title: Oxygen and Hydrogen Isotope Geochemistry of Zeolites

Bachelor of Science (Honors), University of Iceland, 1978.
Major: Geology
Dissertation Title: Some Aspects of the Geology and Geochemistry of the Hreppar Formation, Iceland

Endowment Gifts

Endowment, 30,000.00, Knight Raiders Chess Team Scholarship, The Knight Raiders Chess Team Scholarship Endowment was set up due to a generous gift from Dr. Alice White that was matched from another source. (November 16, 2014).

Designated Gift, 10,000.00, Various University Units, Contributions/pledges raised from President's Office, A&S College, School of Law, Business School, Graduate School, Office of International Affairs, Depts of Geosci. EE and CE, Math, Chem. and Pulsed Power Lab. (December 2013).

Planned Gift, 320,000.00, Anonymous, A gift to fund chess scholarships for the next five years (starting in 2012). (December 28, 2012).

Designated Gift, 40.00, Anonymous, Chess Scholarships. (June 2012).

Designated Gift, 80.00, Anonymous, Annual donation for chess player scholarships. (June 2011).

Designated Gift, 80.00, Anonymous, A contribution towards chess scholarships. (June 2010).

TEACHING

Courses Taught

Texas Tech University
1303, Physical Geology, 2 courses.
4320, Optical Mineralogy and Crystallography, 1 course.
5300, Individual Studies in Geochemistry, 1 course.
GEOL 1101, Physical Geology Laboratory, 21 courses.
GEOL 1303, Physical Geology, 30 courses.
GEOL 4300, Independent Studies in Geology, 2 courses.
GEOL 4312, Undergraduate Research, 4 courses.
GEOL 4320, Optical Mineralogy and Crystallography, 20 courses.
GEOL 5001, Problems in Geosciences, 1 course.
GEOL 5300, Optical Mineralogy and Crystallography, 3 courses.
GEOL 6000, Master's Thesis, 4 courses.
Directed Student Learning

James Green, Doctoral Advisory Committee Member, "Dissolution, Translocation, and Precipitation of Sulfate in Gypsiferous Soils," Plant & Soil Science. (October 31, 2014 - Present).

Clyde Barbian, Master's Thesis Committee Member, "An Investigation of the Oceanic Lithosphere and Upper Mantle beneath the Hawaiian Islands utilizing PP/SS Bouncepoints and Receiver Functions," Geosciences. (September 15, 2014 - Present).

Changjie Liu, Doctoral Advisory Committee Member, "Global and Site-Specific Isotope Geochemistry of Small Organic Molecules," Geosciences. (June 27, 2012 - Present).

Cassidy Sooter, Dissertation Committee Member, "Recycling of Zeolite Filters Through the Use of Electrodialysis," Plant & Soil Science. (May 11, 2009 - Present).


Tave, Matthew, Master's Thesis Committee Member, "Imaging the Crust and Moho beneath Oklahoma using Receiver Functions and Pn Tomography; with Emphasis on the Southern Oklahoma Aulacogen," Geosciences. (April 2013 - May 2013).

Zaneta McCoy, Dissertation Committee Member, Geosciences. (September 1, 2009 - June 2011).


David Schmidt, Doctoral Advisory Committee Co-Chair, Geosciences. (2009).

RESEARCH

Published Intellectual Contributions

Abstract


Computerized Test Bank for Instructors


Conference Proceeding


**Journal Article, Academic Journal**


**Journal, Edited Special Issue**


**Test Bank for Understanding Earth 6th Ed.**


**Presentations Given**


Kleffner, M. A. (Presenter & Author), Barrick, J. (Author Only), Karlsson, H. (Author Only), North-Central-North East Region, "Recognition of the Mulde Event and Mulde positive carbon isotope excursion (Late Wenlock; Silurian) in the North American Midcontinent basins and arches region of southern Laurentia (Indiana, Ohio, Ontario)," Geological Society of America, Pittsburgh, PA. (April 20, 2011).


Media Contributions

Internet

Chessdom. (April 15, 2011).

Newspaper

Daily Toreador. (April 8, 2011).

Daily Toreador. (February 8, 2011).


TV


Research in Progress

"UIL/CIS/Chess Puzzle-Solving" (Complete). (December 1, 2010).

The investigation of Community in Schools (CIS) children's experiences with Chess Puzzle-Solving to evaluate Chess Puzzle-Solving as a viable UIL activity.

Research Interests

true, Geochemistry, Geology, Isotope Geochemistry, Mineralogy, Physical Geology, Planetary Geology, Volcanology, Stable Isotopes, Zeolites, Basalts, Geology of Iceland, Mineralogy, Paleoclimate, Icelandic Culture, History of Iceland, The Icelandic Language, Icelandic Volcanoes

SERVICE

University Service

Nominator.

Student Org Advisor (Non-Professional Org), Nordic Club. (November 2011 - Present).

Mentor and Overall Advisor. (February 2003 - Present).

Student Org Advisor (Non-Professional Org), Knight Raiders Chess Club. (January 2003 - Present).
Program Organizer, 60th Pan-Intercollegiate Chess Team Tournament. (December 15, 2012 - January 3, 2014).

Program Organizer, A Decade of Excellence. (August 26, 2013 - October 21, 2013).

Wrote a letter supporting a nomination. (March 24, 2013 - March 27, 2013).

Wrote a letter supporting a nomination. (March 24, 2013 - March 27, 2013).

Dean's Representative, Mohammad Nazari's Dissertation Committee. (March 25, 2013).


Dean's Representative, Lulu Ma's Dissertation Committee. (March 21, 2013).

Dean's Representative, Qiu Liming's Dissertation Committee. (March 1, 2013).

Student Recruiter. (December 26, 2012 - December 31, 2012).

Committee Member, SPICE Advisory Board. (September 2010 - June 2012).

Committee Member, SPICE Scholarship Committee. (September 2007 - February 2012).

Tournament Director (FIDE). (October 2011).

Nominator. (January 2011 - April 2011).

Nominator. (January 2011 - February 2011).

Department Service


Committee Chair, Geosciences Faculty Awards Committee. (November 2011 - June 2012).

Event Organizer. (September 2011).

Faculty Reader/Evaluator. (February 17, 2010 - February 18, 2010).

Teaching evaluation for tenure and promotion. (2009).

Professional Service


Field Trip Leader, Knight Raiders, Carlsbad, New Mexico. (November 14, 2014 - November 15, 2014).


Public Service

Member, USCF Chess College Committee. (September 2007 - Present).

Program Organizer, Knight Raiders Chess Club, Lubbock, Texas. (February 2003 - Present).

Recommender, College of Arts and Sciences/TTU, Lubbock, Texas. (January 31, 2011).


Letter of Recommendation, International Cultural Center/Texas Tech University, Lubbock, Texas. (October 5, 2010).

Recommender, National Society of College Scholars, Lubbock, Texas. (July 5, 2010).

Service Awards and Honors

Service, University

Outstanding Student Organization Advisor (Special Interest) 2010-2011, Texas Tech University. (April 29, 2011).

GENERAL

Development Activities Attended

Workshop, "President's Leadership Institute," Texas Tech University, Lubbock, Texas, USA. (March 26, 2014).


Workshop, "President's Leadership Institute," Texas Tech University, Lubbock, Texas, USA. (February 19, 2014).

Workshop, "President's Leadership Institute," Texas Tech University, Lubbock, Texas, USA. (January 22, 2014).

Workshop, "President's Leadership Institute," Texas Tech University, Lubbock, Texas, USA. (November 7, 2013).

Workshop, "President's Leadership Institute," Texas Tech University, Lubbock, Texas, USA. (October 31, 2013).

Jeff A. Lee  
Texas Tech University  
jeff.lee@ttu.edu

Education and Post Graduate Training

Ph D, Arizona State University, 1990.  
Major: Geography  
Dissertation Title: The Effect of Desert Shrubs on Shear Stress from the Wind: An Exploratory Study

MA, University of California, Los Angeles, 1984.  
Major: Geography  
Dissertation Title: Sand Transport on a Barchan Dune

BA, University of California, Los Angeles, 1979.  
Major: Geography-Analysis and Conservation of Ecosystems

Academic and Professional Experience

Department Chair, Geosciences, Texas Tech University. (September 1, 2013 - Present).

Professor, Texas Tech University. (September 1, 2009 - Present).

TEACHING

Courses Taught

Texas Tech University
  1401, Physical Geography, 1 course.  
  4357, Geography of Arid Lands, 1 course.  
  5301, Nature of Science for Teachers, 1 course.  
  5306, Seminar in Geography of Arid Lands, 1 course.  
  ATMO 4300, Independent Studies in Atmospheric Science, 1 course.  
  CASC 3300, Introduction to Integrative Research in Arts and Sciences, 1 course.  
  CASC 4350, Capstone in Integrative Research in Arts and Sciences, 1 course.  
  GEOG 1101, Physical Geography Laboratory, 1 course.  
  GEOG 1401, Physical Geography, 11 courses.  
  GEOG 3335, Field Seminar in Physical Geography, 6 courses.  
  GEOG 4300, Seminar in Geography, 1 course.  
  GEOG 4301, 4301 - GEOMORPHOLOGY IN ENVIRON MGMT, 1 course.  
  GEOG 4310, Internship in Geography, 5 courses.  
  GEOG 4357, Geography of Arid Lands, 3 courses.  
  GEOG 4369, Independent Research in Geography, 10 courses.  
  GEOG 5304, Advanced Physical Geography, 7 courses.  
  GEOG 5306, Seminar in Geography of Arid Lands, 3 courses.  
  GEOG 5309, Seminar in Regional Analysis, 1 course.  
  GEOG 5310, Readings in Geography, 9 courses.  
  GEOG 5312, Seminar in Geographic Thought, 1 course.  
  GEOG 6000, Master's Thesis, 11 courses.  
  GEOG 7000, Research, 12 courses.  
  GEOL 1101, Physical Geology Laboratory, 16 courses.  
  GEOL 4300, Independent Studies in Geology, 1 course.
GEOL 4312, Undergraduate Research, 1 course.
GEOL 5001, Problems in Geosciences, 1 course.
GEOL 5300, Individual Studies in Geology, 2 courses.
HONS 2406, Honors Integrated Science II, 2 courses.
IS 1100, Tech Transition: Freshman Seminar, 2 courses.
IS 5301, The Nature of Science for Teachers, 3 courses.

**Directed Student Learning**

Tarek Kandakji, Dissertation Committee Chair, Geosciences. (August 23, 2015 - Present).

Thu Nguyen, Dissertation Committee Co-Chair, Geosciences. (August 23, 2015 - Present).

Amanda Brockway, Master's Thesis Committee Chair. (November 1, 2014 - Present).

Sarah Johnson, Master's Thesis Committee Chair. (October 15, 2014 - Present).

Michele Freyder, Master's Thesis Committee Chair, Geosciences. (September 15, 2014 - Present).

Prudence Venner, Master's Thesis Committee Chair. (September 15, 2014 - Present).

Ying Liu, Dissertation Committee Member. (August 23, 2014 - Present).

Benjamin Gandy, Master's Thesis Committee Member. (May 1, 2014 - Present).

Brittany Walker-Pratt, Master's Thesis Committee Chair, Interdisciplinary. (June 1, 2014).

Cullen Dunkerson, Dissertation Committee Member, Geosciences. (May 2014).

Tiffany Lambert, Master's Thesis Committee Chair, Geosciences. (May 2014).

Christopher Davis, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Gordon Williamson, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Krista Holter, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Lindsey Faircloth, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Patti Josey, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Roxanne Davis, Master's Thesis Committee Member, Other (Within Texas Tech University). (June 2011 - May 2014).

Porfirio Peinado, Dissertation Committee Member, "GEOCHEMICAL CHARACTERIZATION OF MINERAL DUST SOURCES IN THE CHIHUAHUAN DESERT AND SOUTHERN HIGH PLAINS REGIONS," Civil & Environmental Engineering. (February 2012 - May 2013).
Joseph Massey, Master's Thesis Committee Chair, "A wind tunnel investigation to examine the role of air humidity in controlling the threshold shear velocity of a surface and in controlling the mass flux of material from a surface," Other (Within Texas Tech University). (April 2013).

Thomas Mockford, Master's Thesis Committee Chair, "Effect of soil texture and calcium carbonate on laboratory-generated dust emissions from SW North America," Other (Within Texas Tech University). (April 2013).

Caitlin Grann, Master's Thesis Committee Member, "Exploring the Character of Place in Lubbock through Interviews, Mental Maps, and the Place Histories of Local Musicians," Geosciences. (April 2013).

Rachel Lamm, Other, Other (Within Texas Tech University). (June 10, 2012 - June 20, 2012).

Dorothy Davis, Other, Other (Within Texas Tech University). (June 10, 2012 - June 18, 2012).

Jeremy Wagner, Other, Other (Within Texas Tech University). (June 10, 2012 - June 18, 2012).

Shane Burk, Other, Other (Within Texas Tech University). (June 10, 2012 - June 18, 2012).

Sherry Wagner, Other (Within Texas Tech University). (June 10, 2012 - June 18, 2012).

Mark Vaughn, Master's Thesis Committee Chair, Other (Within Texas Tech University). (May 16, 2012).


Renaldo Arroyo, Master's Thesis Committee Chair, Other (Within Texas Tech University). (May 2011).

Brandy Land, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Karlton Land, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Michael Thornton, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Natasha Cox, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Paula Everett, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Sean McFarland, Master's Thesis Committee Member, Other (Within Texas Tech University). (March 2011).

Ada Warren, Master's Thesis Committee Member, "Analysis of Precipitation and Saturated Thickness of the Texas Ogallala Aquifer," Other (Within Texas Tech University). (May 2010).


Jenny Jo Cox, Master's Thesis Committee Member, "Wind Tunnel studies of erosion," Plant & Soil Science. (September 30, 2009).

RESEARCH

Published Intellectual Contributions

Editorial


Encyclopedia


Encyclopedia entry


Journal Article, Academic Journal


Journal Article, Professional Journal


Presentations Given


Lee, J. (Author Only), Climate Science Center Interdisciplinary Seminar Series, "Causes of Wind Erosion in the Dust Bowl," Texas Tech University Climate Science Center, Texas Tech University. (February 4, 2014).


Contracts, Grants and Sponsored Research

Grant


Research in Progress

"Nature of the Llano Estacado" (On-Going).
Edited book (by me) to be submitted to Texas A&M University Press

"Wind Erosion in the Dust Bowl" (Writing Results).
Review paper to be submitted to "Aeolian Research"

Research Interests

true, Physical Geography,Geomorphology, Wind Erosion, Dust Storms, History of Earth Sciences

SERVICE

University Service

Committee Member, Core Curriculum Portfolio Committee. (April 2013 - Present).

Committee Chair, Core Curriculum Committee. (August 2012 - Present).


Committee Member, Natural Resources Management Graduate Program Review Committee. (December 1, 2011 - March 5, 2012).

Graduate School Representative for PhD defense, PhD committee for Lynn Dipier. (June 24, 2010 - 2010).

Graduate School Representative for PhD defense, PhD committee for Amy Morehouse. (June 9, 2010).
**College Service**

Committee Member, Tenure and Promotion. (October 10, 2012 - November 15, 2012).

**Department Service**

Committee Member, Dept. Geosciences Executive Committee. (April 2010 - August 31, 2013).

Coordinator of Geography Program. (September 2002 - August 2013).

**Professional Service**

Secretary and Treasurer, International Society for Aeolian Research. (July 2010 - Present).

Editor, Journal Editor, Aeolian Research. (January 1, 2008 - Present).

Reviewer, External Tenure, Texas A&M University. (August 6, 2015 - August 12, 2015).


Reviewer, Grant Proposal, Israel Science Foundation. (March 4, 2015 - March 5, 2015).


Reviewer, External Tenure, University of Arkansas Little Rock. (September 15, 2014 - September 17, 2014).

Reviewer, Journal Article, Aeolian Research. (September 6, 2014).


Reviewer, Grant Proposal, National Geographic Society. (December 15, 2013 - December 17, 2013).

Outside reviewer for promotion, University of Northern Iowa. (November 18, 2013 - November 26, 2013).


Session Chair, American Geophysical Union, San Francisco, California. (December 6, 2012).


Reviewer, Grant Proposal, National Geographic Society. (April 10, 2012 - April 12, 2012).

External reviewer for tenure and promotion, Hebrew University of Jerusalem, Jerusalem. (February 5, 2012 - February 7, 2012).


Reviewer, Grant Proposal, National Science Foundation. (October 10, 2011 - October 18, 2011).


Reviewer, Journal Article, USDA ARS. (October 20, 2010).

Reviewer, Textbook, Oxford University Press. (October 1, 2010 - October 15, 2010).


Reviewer, Textbook, Elsevier Publishing. (September 1, 2010 - September 7, 2010).

Officer, Treasurer, International Society for Aeolian Research. (March 2008 - July 2010).

Reviewer, Ad Hoc Reviewer. (October 1, 2009 - October 31, 2009).

Public Service

Task Force Member, DIG Texas, Houston, Texas. (March 2011 - November 2012).

Service/Performance Partnerships

DIG Texas (Diversity in Geosciences), Service on Boards, Committees, and Commissions, The purpose of DIG Texas (Diversity in Geosciences) is to promote diversity in earth science education in K-12 and college. In addition, generally promoting earth science education at the K-12 level. (May 2012 - June 2012).
Service Awards and Honors

Service, Community

John M. Burns Outreach Award for Outstanding Faculty at Texas Tech University, Texas Tech University/Howard Hughes Medical Institute Science Education Program. (November 2010).

GENERAL

Professional Memberships

American Association for the Advancement of Science.

Association of American Geographers.

Treasurer, International Society for Aeolian Research.

Geological Society of America. (October 1, 2013 - Present).

American Geophysical Union. (2010 - Present).

Sigma Xi. (March 15, 2011 - February 15, 2013).
Education and Post Graduate Training

Ph D, University of Texas at Austin, 1985.
    Major: Geological Sciences
    Dissertation Title: Stratigraphy, sedimentology, and paleontology of Upper Cretaceous
    (Campanian-Maastrichtian) sedimentary rocks in Trans-Pecos Texas

MA, University of Texas at Austin, 1982.
    Major: geological sciences
    Dissertation Title: A ceratopsian bone-bed from the Aguja Formation (Upper Cretaceous) Big
    Bend National Park, Texas

BS, University of New Mexico, 1978.
    Major: geology

Academic and Professional Experience

Research Fellow, Texas Natural Science Center, Vertebrate Paleontology Laboratory.
    (March 2011 - Present).
    affiliated worker - research fellow

professor, Texas Tech University. (August 1999 - Present).

TEACHING

Courses Taught

Texas Tech University
    1303, physical geology, 1 course.
    4101, undergraduate seminar, 1 course.
    GEOL 1101, Physical Geology Laboratory, 12 courses.
    GEOL 1102, Historical Geology Laboratory, 4 courses.
    GEOL 1303, Physical Geology: Majors Only, 5 courses.
    GEOL 1304, Historical Geology, 1 course.
    GEOL 2401, Historical Geology, 4 courses.
    GEOL 4001, Problems in Geosciences, 2 courses.
    GEOL 4101, Undergraduate Seminar, 3 courses.
    GEOL 4201, Field Methods in Sedimentary Geology, 10 courses.
    GEOL 4300, Independent Studies in Geology: Geology of Texas, 4 courses.
    GEOL 4301, Advanced Fields Methods, 7 courses.
    GEOL 4312, Undergraduate Research, 17 courses.
    GEOL 4318, Geology of Texas, 2 courses.
    GEOL 4325, Sedimentology and Stratigraphy, 6 courses.
    GEOL 5001, Problems in Geosciences, 1 course.
    GEOL 5300, Individual Studies in Geology: Sedimentology and Stratigraphy, 5 courses.
    GEOL 5424, Clastic Sedimentology, 6 courses.
    GEOL 6000, Master's Thesis, 14 courses.
    GEOL 7000, Research, 20 courses.
GEOL 8000, Doctor's Dissertation, 11 courses.

Non-Credit Instruction

Guest Lecture, National Park Service, Big Bend National Park, 40 participants. (October 8, 2011).
Guest Lecture, Department of Geosciences, TTU, 60 participants. (January 21, 2011).
Guest Lecture, Plant and Soil Science Department, 20 participants. (2009).

Directed Student Learning

Matthew Pippin, Master's Thesis Committee Member, Geosciences. (2015 - Present).
Christopher Straub, Undergraduate Research, Geosciences. (2015 - Present).
Landon Oliver, Undergraduate Research, Geosciences. (2015 - Present).
Jacob Cobb, Master's Thesis Committee Chair, Geosciences. (2014 - Present).
Thomas Shiller, Dissertation Committee Chair, Geosciences. (2012 - Present).
Kenneth Cassady, Master's Thesis Committee Member, Geosciences. (2012 - Present).
Kevin Hoch, Master's Thesis Committee Member, Geosciences. (2012 - Present).
Travis Conley, Dissertation Committee Member, Plant & Soil Science. (2011 - Present).
Alyson Brink, Dissertation Committee Chair, Geosciences. (2007 - Present).
Bill Muehler, Dissertation Committee Member, Geosciences. (2006 - Present).
Phil Frederick, Dissertation Committee Member, Geosciences. (2013 - 2015).
Christopher Gerik, Undergraduate Research, Geosciences. (2014).
Paul Alex Moore, Undergraduate Research, Geosciences. (2014).
Volkan Sarigul, Dissertation Committee Member, Geosciences. (2013 - 2014).
Ashley Adams, Master's Thesis Committee Member, Geosciences. (2013 - 2014).
Steven Wick, Master's Thesis Committee Member, Geosciences. (2013 - 2014).
Ashley Saelans, Master's Thesis Committee Member, Geosciences. (2012 - 2014).
Chris Treat, Master's Thesis Committee Member, Geosciences. (2012 - 2014).
Brent Williams, Undergraduate Research, Geosciences. (2013).
Jacob Van Veldhuizen, Master's Thesis Committee Member, Geosciences. (2012 - 2013).
Wesley (James) Vinson, Undergraduate Research, Geosciences. (2012 - 2013).
Nicole Reynaud, Dissertation Committee Member, Geosciences. (2007 - 2013).
Marissa Westerfield, Master's Thesis Committee Chair, Geosciences. (2006 - 2013).
Justin Fortney, Undergraduate Research, Geosciences. (2012).
Michael Braswell, Undergraduate Research, Geosciences. (2012).
Thomas Knight, Undergraduate Research, Geosciences. (2012).
Ashley Gilbreath, Undergraduate Research, Geosciences. (2010 - 2011).
Caleb Lewis, Master's Thesis Committee Chair, Geosciences. (2009 - 2011).
Zaneta Martinez-McCoy, Master's Thesis Committee Chair, Geosciences. (2009 - 2011).
Ryan Lellis, Master's Thesis Committee Member, Geosciences. (2009 - 2010).
Chris Treat, Undergraduate Research, Geosciences. (2009 - 2010).
Jordan Mowery, Undergraduate Research, Geosciences. (2009 - 2010).
Joshua Boxell, Dissertation Committee Member, Plant & Soil Science. (2008 - 2010).
John Fronimos, Master's Thesis Committee Chair, Geosciences. (2008 - 2010).
Cristina Chavez, Master's Thesis Committee Member, Geosciences. (2007 - 2009).

**RESEARCH**

**Published Intellectual Contributions**

**Journal Article, Academic Journal**


Journal Article, Professional Journal


**geologic maps and cross-sections**


**map, cross-sections, and pamphlet**

**Presentations Given**


**Contracts, Grants and Sponsored Research**

**Grant**


Lehman, T. (Co-Principal), Johnson, E. (Co-Principal), Allen, B. L. (Co-Principal), Holliday, V. (Co-Principal), "Late Quaternary landscape and hunter-gatherer land use strategies at the edge of the Llano Estacado," Sponsored by Vice President for Research, TTU, Texas Tech University. (2007 - 2010).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Journal Article, Professional Journal**

Lehman, T. Habitat of the giant pterosaur Quetzalcoatlus: a paleoenvironmental reconstruction of the Javelina Formation (Upper Cretaceous), Big Bend National Park, Texas. *Society of Vertebrate Paleontology Memoir*.

**Research Report**

Rainwater, K., Song, L., Lehman, T., Schroeder, J. *An Integrated Wind-Water Desalination Demonstration Plant for an Inland Municipality* (pp. 57). Texas Department of Agriculture and Texas Water Development Board.
Research Interests

true, sedimentology, stratigraphy, paleontology

SERVICE

University Service

departmental key worker, State Employee Charitable Campaign. (1987 - Present).

Department Service

Faculty Advisor, Physical Geology Lab Coordinator. (2007 - Present).
Committee Chair, Tenure and Promotion Committee. (2013).
Committee Chair, Comprehensive Performance Evaluation. (2011).
Committee Member, Search Committee - Sedimentology position. (2011).
Committee Member, Tenure and Promotion Committee. (2011).
peer teaching evaluation. (2010).
Committee Chair, undergraduate committee. (2007 - 2010).
Faculty Mentor, Geoscience Society field trip leader. (2009).

Professional Service

Research Associate, Jackson School of Geosciences. (2011 - Present).

Public Service

Fossil (sea turtle) identification for Brian Worley (Dallas, TX), Individual Consultation. (2014).
assistance with dinosaur trackway identification, Individual Consultation. (October 2, 2012 - October 9, 2012).
identification of fossil bison bones, Individual Consultation. (February 16, 2012 - February 17, 2012).
assistance with K-12 lesson plans, Individual Consultation. (October 18, 2011).
identification of fossil specimens, Individual Consultation. (July 26, 2011).
fossil specimen identification, Individual Consultation. (July 12, 2011).

identification of petrified wood specimens, Individual Consultation. (June 30, 2011).

identification of fossil specimens, Individual Consultation. (June 27, 2011).


donation of fossil specimens, Museum of Texas Tech University. (March 21, 2011).


GENERAL

Consulting

For Profit Organization, Darrell Browlow, Crockett and Reagan counties. (May 9, 2012 - May 10, 2012).


Professional Memberships


Education and Post Graduate Training

Postdoctoral.
  Major: Geology / Geomorphology

Ph D, University of Manitoba, 2001.
  Major: Geological Sciences
  Dissertation Title: Discriminating Lithology in Arctic Environments from Earth Orbit: An
  Evaluation of Satellite Imagery and Classification Algorithms

MS, University of Ottawa, 1995.
  Major: Earth Science
  Dissertation Title: Prediction of 'Depth to Late-Summer Frozen Ground' Using Satellite
  Imagery and Digital Topographic Data, Mayo, Yukon Territory

BA, University of Ottawa, 1992.
  Major: Physical Geography

Academic and Professional Experience

Associate Professor, Texas Tech University - Geosciences.
  Teaching, research, service.

Assistant Professor, Texas Tech University - Geosciences. (July 20, 2005 - Present).
  Professorial position involving teaching, research, and service.
  This position has continued until the present.

TEACHING

Courses Taught

Texas Tech University
  Introduction to Physical Geology, 1 course.
  1303, Introduction to Physical Geology, 2 courses.
  5341, Digital Imagery in the Geosciences, 1 course.
  GEOL 1101, Physical Geology Laboratory, 26 courses.
  GEOL 1303, Physical Geology, 7 courses.
  GEOL 3301, Geomorphology, 13 courses.
  GEOL 4001, Problems in Geosciences, 2 courses.
  GEOL 4101, Undergraduate Seminar, 5 courses.
  GEOL 4300, Independent Studies in Geology, 2 courses.
  GEOL 4312, Undergraduate Research, 12 courses.
  GEOL 4331, Digital Imagery in Geosciences, 12 courses.
  GEOL 5001, Problems in Geosciences, 1 course.
  GEOL 5341, Digital Imagery in Geosciences, 12 courses.
  GEOL 6000, Master's Thesis, 13 courses.
GEOL 7000, Research, 7 courses.
GEOL 8000, Doctor's Dissertation, 4 courses.

Directed Student Learning

Matthew Pippin, Master's Thesis Committee Member, "Fluvial overprinting of glacially-induced, quartz microtextures, Salmon and Bear rivers, Alaska and British Columbia," Geosciences. (2015 - Present).

David Brannan, Master's Thesis Committee Member, "Fluvial overprinting of glacially-induced quartz microtextures, Chitina River, Alaska." (August 2015).


David Manoukian, Master's Thesis Committee Member, "Characterizing the damage zone along portions of the Montosa fault, central New Mexico." (May 2015).

Christopher Mock, Undergraduate Research, "Inference of Viscosities and Effusion Rates from the Morphologies of Digitate Lava Flows, Daedalia Planum, Mars," Geosciences. (December 2014).


Shanaz Shafian, Dissertation Committee Member, Plant & Soil Science. (March 2014).

Knupple Mark, Master's Thesis Committee Member, Geosciences. (November 2012 - July 2013).

Josh Hopper, Master's Thesis Committee Chair, "Channels of South Elysium, Mars," Geosciences. (September 2009 - December 2012).


Fang Yuan, Master's Thesis Committee Member, "Crustal Structure of Salton Trough using Deformable Layer Tomography," Geosciences. (September 2010 - October 2012).

Paul Gifford, Master's Thesis Committee Member, "Kinematic Evolution of Fractures on Enceladus." (September 2010 - October 2012).

Kevin Pratt, Master's Thesis Committee Member, "Common Conversion Point Imaging of the Western United States: Improved Methods for Receiver Function Stacks." (September 2010 - May 2012).

Mark Vaughn, Other. (April 2012).


Jeff Hoemberg, Master's Thesis Committee Member, Geosciences. (December 2010).


Hui Liu, Dissertation Committee Member, Geosciences. (August 2010).


Jessica Torrion, Dissertation Committee Member, Plant & Soil Science. (2009).


RESEARCH

Published Intellectual Contributions

Abstract


Book Review


Journal Article, Academic Journal


Leverington, D. (2014). Did large volcanic channel systems develop on Earth during the Hadean and Archean?. Precambrian Research, 246, 226-239.


**Presentations Given**


Leverington, D., Invited talk, "Is early development of large volcanic channels typical of all rocky planets?" Lunar and Planetary Institute, Houston, TX. (April 17, 2015).

Leverington, D., Lunar and Planetary Science Conference, "Did large volcanic channel systems form on Earth during the Hadean and Archean?" Houston, TX. (March 2014).


Leverington, D., AGU Annual Meeting, "Do all rocky planets undergo early development of large volcanic outflow channels?" American Geophysical Union, San Francisco, CA. (December 2012).


Leverington, D. (Presenter & Author), Fall Meeting of the American Geophysical Union, "Inconsistencies in the estimates of near-surface water abundance are reconciled by the volcanic origin of Martian outflow channels," American Geophysical Union, San Francisco. (December 2010).

Hopper, J. (Presenter & Author), Leverington, D. (Presenter & Author), Fall Meeting of the American Geophysical Union, "The properties of Hrad Vallis are consistent with volcanic origins," American Geophysical Union, San Francisco. (December 2010).


Leverington, D. (Presenter & Author), Lunar and Planetary Science Conference, "Volcanic interpretations of the Martian outflow channels are consistent with surface mineralogy," (March 2010).

Calderon, S. (Presenter & Author), Leverington, D. (Author Only), Annual Meeting of the American Geophysical Union, "GIS-Based paleotopographic reconstructions of the Queen Elizabeth Islands at 8500 14C yr B.P.," San Francisco. (December 2009).

Media Contributions

Internet


Newspaper


TV

FOX34 (Lubbock). (August 11, 2011).

Research Interests

true, I conduct research regarding surface processes and landforms, as well as the use of remote sensing and GIS techniques in the study of surface environments. Much recent work has involved study of the planet Mars.

SERVICE

College Service

Committee Member, Bachelor of Science Requirements for Arts and Sciences. (January 12, 2015 - May 2015).

Department Service

Committee Member, Undergraduate Committee. (January 2009 - Present).


Committee Chair, Comprehensive Performance Evaluation Committee for Gary Elbow. (March 2014).

Committee Member, T&P committee for Cindy Sorensen. (2013).

Committee Member, Third Year Review Committee for 3 Atmo Profs. (2013).

Committee Member, GIS Search Committee. (January 15, 2013 - April 2013).


Faculty Advisor, Geosciences Honor Society. (2009 - 2011).

Department web page. (2010).

**Professional Service**

Reviewer, Grant Proposal, National Science Foundation, Division of Polar Programs. (July 20, 2015).


Reviewer, Grant Proposal, National Science Foundation, Division of Polar Programs. (June 25, 2015).


Reviewer, Grant Proposal, Natural Sciences and Engineering Research Council (Canada). (December 18, 2014).


Reviewer, Grant Proposal, POLESTARS Program (National Science Foundation). (July 23, 2014).


Reviewer, Grant Proposal, Sultan Qaboos University (Oman). (January 21, 2014).

Reviewer, Grant Proposal, National Science Foundation. (October 17, 2013).

Reviewer, Grant Proposal, NASA LASER Program. (June 20, 2013).


Reviewer on 8 Grant Proposals; participant in 5-day panel in Washington DC., NASA Mars Fundamental Research Program (MFRP). (October 25, 2011).
Reviewer, Journal Article, Quaternary International. (July 2, 2011).

**GENERAL**

**Professional Memberships**

American Geophysical Union. (2001 - Present).

Dr. Kevin R. Mulligan  
Texas Tech University  
(806) 834-0391  
kevin.mulligan@ttu.edu

Education and Post Graduate Training

Ph D, Texas A&M University, 1997.  
Major: Geography  
Dissertation Title: Aeolian Process Controlling Dunes Morphology, Salton Sea, California.

MA, University of California, Los Angeles, 1985.  
Major: Geography  
Dissertation Title: The Movement of Transverse Coastal Dunes, Pismo Beach, California, 1982-83.

BA, University of California, Los Angeles, 1979.  
Major: Geography

Academic and Professional Experience

Director, Center for Geospatial Technology, Texas Tech University. (2006 - Present).

Associate Professor of Geography, Department of Geosciences, Texas Tech University.  
(2005 - Present).

Associate Professor of Geography, Department of Economics and Geography, Texas Tech University. (2005 - 2010).

TEACHING

Courses Taught

Texas Tech University

3300, Geographic Information Systems, 1 course.  
5300, Geographic Information Systems, 1 course.  
GEOG 3300, Geographic Information Systems, 26 courses.  
GEOG 4302, Advanced Geographic Information Systems, 8 courses.  
GEOG 4357, Geography of Arid Lands, 1 course.  
GEOG 4369, Independent Research in Geography, 3 courses.  
GEOG 5300, Geographic Information Systems, 14 courses.  
GEOG 5302, Advanced Geographic Information Systems, 4 courses.  
GEOG 5306, Seminar in Geography of Arid Lands, 1 course.  
GEOG 5310, Readings in Geography, 6 courses.  
GEOG 6000, Master's Thesis, 1 course.  
GEOG 7000, Research, 4 courses.  
GIST 3300, Geographic Information Systems, 37 courses.  
GIST 4308, Cartographic Design, 6 courses.  
GIST 5300, Geographic Information Systems, 13 courses.  
GIST 5302, 1 course.  
GIST 5308, Cartographic Design, 6 courses.
Directed Student Learning

Lucas Heintzman, Dissertation Committee Member, Biological Sciences. (2015 - Present).

Thu Nguyen, Dissertation Committee Member, Geosciences. (2015 - Present).

Ying Liu, Dissertation Committee Member, Geosciences. (2015 - Present).

Fahad Almutlaq, Dissertation Committee Chair, Geosciences. (2014 - Present).

Daniel Holman, Dissertation Committee Member, Electrical & Computer Engineering. (2014 - Present).

Jason Post, Dissertation Committee Member, Geosciences. (2014 - Present).


Andrei Gorovets, Master's Thesis Committee Chair, Geosciences. (2014 - Present).

Kamal Humagian, Dissertation Committee Member, "Land Cover Change and Impact of Forest Restoration Techniques in the South-West Jemez Mountains, New Mexico," Natural Resources Management. (2013 - Present).

Scott Starr, Dissertation Committee Member, Biological Sciences. (2013 - Present).

De Gao, Dissertation Committee Member, "Biogeography of Herpetofaunas in the West Indies and Alien Invasion - Cause, Threat and Conservation," Natural Resources Management. (2012 - Present).

Colton Laws, Master's Thesis Committee Member, Natural Resources Management. (2012 - Present).


Corey Bryant, Master's Thesis Committee Member, "Comparison of Two Satellite Platforms for use in Land Use/Land Cover Classification in Agricultural Regions," Plant & Soil Science. (December 2014).


Micah-John Beierle, Master's Thesis Committee Member, "Wildfire Ignition Characteristics of the Short Grass Prairie Region of Texas," Natural Resources Management. (August 2012).


Mark Vaughn, Master's Thesis Committee Member, "By Examination." (May 2012).


Laura Navarrete, Master's Thesis Committee Member, "Behavioral Effects of Wind Farms on Wintering Sandhill Cranes on the Texas High Plains," Natural Resources Management. (December 2011).

Matt Huerta, Internship Advisor, "Internship at BAIR (Behavioral Analysis and Intelligence Resources) Software, Inc.," Other (Within Texas Tech University). (August 2011).

Kelly Baker, Master's Thesis Committee Member, "Local Landscape Factors Influencing Diversity and Fitness in Odonates at Playa Wetlands," Biological Sciences. (August 2011).


Mohammed Jambally, Master's Thesis Committee Chair, "GIS and Community Planning," Interdisciplinary. (May 2011).


**RESEARCH**

Published Intellectual Contributions
Book, Chapter in Scholarly Book-New


Conference Proceeding


Esri Map Book Publication


Internet Mapping Application


Journal Article, Academic Journal


Map


Online Report / Monograph


Research Report


Software Application


**Technical Report**


Presentations Given


Rufino, I., Mulligan, K., XX Brazilian Symposium on Water Resources, "Dados Espaciais Globais E Analises Regionais: Geotecnoegias No Estudo De Mudancas No Semiarido, PAP013981 (Global Spatial Data for Regional Analysis: Geotechnology to Study Changes in the Semiarido)," Brazilian Water Resources Association (ABRH), Bento Goncalves, Rio Grande do Sul, Brazil. (November 18, 2013).


Mulligan, K., Spatial Thinking Across the Curriculum, Summer Geography Institute, "GIS and Geospatial Education," College of Education, Texas Tech University. (June 15, 2011).


Mulligan, K., Texas County Appraisal District Meeting, "What is a Geographic Information System?," Texas State Comptroller, Property Tax Assistance Division, Lubbock, Texas. (September 20, 2010).


Contracts, Grants and Sponsored Research

Contract


Grant

Cao, G. (Co-Principal), Solis, P. (Principal), Mulligan, K. (Co-Principal), Portillo Quintero, C. (Co-Principal), "Mappers Without Borders," Sponsored by USAID, Federal, $999,000.00. (September 29, 2015 - December 31, 2019).

Cao, G. (Co-Principal), Barbato, L. (Co-Principal), Mulligan, K. (Principal), "Development of a GIS Model to Project and Map Future Water Availability," Sponsored by USDA ARS, Federal, $40,769.00. (October 1, 2015 - September 30, 2016).


Cao, G. (Co-Principal), Ballou, M. (Principal), Barbato, L. (Co-Principal), Mulligan, K. (Co-Principal), Burow, M. (Co-Principal), Williams, R. (Co-Principal), Seshadri, S. (Co-Principal), Mendu, V. (Co-Principal), West, C. (Co-Principal), Trojan, S. (Co-Principal), Ritchie, G. (Co-Principal), Woodward, J. (Co-Principal), Sarturi, J. (Co-Principal), "Improving Water Productivity and New Water Management Technologies to Sustain Rural Economies-TTU," Sponsored by United States Department of Agriculture, Federal, $340,222.00. (September 1, 2014 - August 31, 2016).
Barbato, L. (Principal), Seshadri, S. (Co-Principal), Mulligan, K. (Co-Principal), "Development of a Dynamic Internet Map for Editing Fireworks Locations," Sponsored by TX Department of Insurance, $17,620.00. (March 24, 2015 - August 31, 2015).


Mulligan, K., Barbato, L. S., "Infrastructure Expansion of the Texas Tech University Columbia Regional Geospatial Service Center," Sponsored by National Guard Bureau / Texas National Guard / Stephen F. Austin State University, Federal, $200,000.00. (September 30, 2009 - January 31, 2010).


Rainwater, K. (Co-Principal), Johnson, J. (Co-Principal), Willis, D. (Co-Principal), Ethridge, D. (Co-Principal), Mulligan, K. (Co-Principal), Fish, E. (Co-Principal), "Ogallala Initiative: Sustainable Rural Economics Through New Water Management Technologies," Sponsored by Department of Agriculture, Federal, $1,000,000.00. (2007 - 2009).

Sponsored Research


Mulligan, K. (Co-Principal), Barbato, L. S. (Co-Principal), "The Texas Tech University Columbia Regional Geospatial Service Center - FY 2010," Sponsored by Texas National Guard / Stephen F. Austin State University, Federal, $850,000.00. (October 1, 2009 - September 30, 2010).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Research Report**


Barbato, L., Seshadri, S., Mulligan, K., Wiger, M. *Research and Development of CPRIT Table Design for Mapping*.

**Technical Report**

Barbato, L., Mulligan, K., Seshadri, S. *CottonWeb Application Components and Workflow for Desktop and Mobile Platforms* (pp. 11).

Barbato, L., Mulligan, K., Seshadri, S. *Software, Hosting and Data Requirements for CottonWeb Desktop and Mobile Applications* (pp. 8).

**Research Interests**

true, Geographic Information Systems, Applied geospatial technologies (GIS, remote sensing, GPS, digital cartography, terrain visualization and Internet mapping).


**SERVICE**
University Service

International Student Development. (August 13, 2015).

Mapathon, Participant. (March 27, 2015).

Faculty Recruitment. (January 8, 2015).

Program Organizer, GIS User Group. (November 12, 2014).

Maps for the Chancellor. (November 12, 2014).

Program Organizer, GIS Day. (November 11, 2014 - November 12, 2014).

Maps for the Water Workshop. (November 11, 2014).

Facilities Tour. (August 7, 2014).

Faculty Recruitment. (May 29, 2014).

Faculty Recruitment. (May 21, 2014).

Faculty Recruitment. (May 20, 2014).

Attendee, Graduation. (May 16, 2014).

Faculty Recruitment. (May 15, 2014).

Facilities Tour. (January 10, 2014).

Committee Member, University Public Art Committee. (2012 - 2013).

Attendee, Convocation. (December 11, 2013).

Dean's Representative, George Herrmann, Ph.D. Defense, Civil Engineering. (October 17, 2013).

Attendee, Graduation. (May 17, 2013).

Attendee, Graduation. (May 18, 2012).

Attendee, Graduation. (December 17, 2011).

Attendee, Graduation. (May 13, 2011).


Dean's Representative, Vinicius B. Bufon, Ph.D. Defense, Agronomy. (November 27, 2009).

College Service


Holden Hall Building Management Information System. (August 2015).
Facilities Tour. (September 14, 2011).

**Department Service**

Department of Geosciences Webmaster. (2014 - Present).

Faculty Advisor, Graduate Certificate in GIST. (2013 - Present).


HONS 3302: One Health. (February 12, 2015).

Department of Geosciences Web Site Development. (2014).

Committee Member, Pevehouse Faculty Search Committee. (2012 - 2014).

Degree Program Coordinator, Graduate Certificate Program in GIST. (2012 - 2013).

Degree Program Coordinator, Undergraduate Minor in GIST. (2012 - 2013).

Committee Member, GIS Faculty Search Committee. (2011 - 2013).

PAUD 5326: Information Technology in Public Administration. (November 6, 2013).


GEOG 1401: Physical Geography. (November 2011).

GEOG 5312: Seminar in Geographic Thought. (October 17, 2011).

PAUD 5326: Information Technology in Public Administration. (October 13, 2011).

GEOG 2300: Introduction to Human Geography. (February 4, 2011).

Committee Member, Department of Economics and Geography, Graduate Committee. (2009 - 2010).

**Professional Service**

Attendee, Meeting, USDA ARS, Ogallala Aquifer Program Workshop, Manhattan, Kansas. (March 12, 2015 - March 13, 2015).

Task Force Member, U.S. Department of Labor, ETA. (July 2014).

Reviewer, Grant Proposal, USDA ARS Ogallala Aquifer Program. (July 2014).

Visiting Scholar Host. (August 2012 - June 2013).

Committee Member, Ogallala Aquifer Program, Playa Lakes Symposium Steering Committee. (2011 - 2012).

Attendee, Meeting, Texas Tech University Water Summit, Lubbock, Texas. (July 11, 2012).


Attendee, Meeting, USDA, Agricultural Research Service, Playa Workshop, Lubbock, Texas. (February 8, 2012).

Public Service

Dearth Exhibit: Louise Hopkins Underwood Center for the Arts, Advisor. (May 1, 2015 - June 27, 2015).

Dearth Project, Advisor. (October 4, 2014).


Llano Map for All Saints Episcopal School. (May 5, 2014).

Guest Speaker, New Deal High School. (April 12, 2013).

Discussant, Media Webinar, Lubbock, Texas. (October 24, 2012).

Guest Speaker, Society of Environmental Journalists, Lubbock, Texas. (October 20, 2012).


Guest Speaker, New Deal High School, New Deal, Texas. (April 2, 2012).

Guest Speaker, Beyond the Windshield: Dwelling in the Natural World, 23rd Annual Southern Plains Conference, Beyond, Muleshoe, Texas. (February 9, 2012).


Map Production, West Texas A&M University. (November 2011).

Satellite Imagery, Guatemala Rural Development. (October 2011).

Guest Speaker, Brownfield Outdoor Classroom Field Days, Oak Grove Elementary School, Brownfield, Texas. (September 22, 2011).


Project Director, Sendai, Japan Earthquake Viewer (Web Mapping Application). (March 2011).

Guest Speaker, Ogallala Commons, Playa Grazing Management Field Day, Nazareth, Texas. (March 24, 2011).
Guest Speaker, Ogallala Commons, Conservation Education Day, Amarillo, Texas. (March 1, 2011).

Interview, Cathy Hillard. (February 24, 2011).

Interview, Helen Quinn, BBC. (January 10, 2011).

Guest Speaker, Yoakum County Soils and Water Conservation District, Plains, Texas. (September 7, 2010).

Guest Speaker, Ogallala Commons, Conservation Education Day, Brownfield, Texas. (May 20, 2010).

Guest Speaker, Ogallala Commons, Conservation Education Day, Bovina, Texas. (February 17, 2010).

Guest Speaker, Ogallala Commons, Conservation Education Day, Tulia, Texas. (February 3, 2010).

Guest Speaker, Ogallala Commons Conservation Education Day, Whiteface, Texas. (January 13, 2010).

Service Awards and Honors

Service, University


GENERAL

Professional Memberships


Development Activities Attended


Education and Post Graduate Training

Ph D, University of Texas at Austin, 1992.
   Major: Geological Sciences

MS, Chiba University, 1987.
   Major: Earth Science
   Supporting Areas of Emphasis: Geophysics

BS, Chiba University, 1985.
   Major: Earth Science
   Supporting Areas of Emphasis: Geophysics

Academic and Professional Experience

Associate Professor, Texas Tech University. (September 1, 2006 - Present).

Endowment Gifts

Gift-in-Kind, 39,387,600.00, Halliburton, Software. (March 2014).

Gift-in-Kind, 13,883,061.00, Schlumberger, Software packages and maintenance contracts.
   (January 16, 2014).

Gift-in-Kind, 10,896,480.00, Schlumberger, Software packages and maintenance contracts.
   (September 22, 2011).

TEACHING

Courses Taught

Texas Tech University
   3428, GIS in Natural Science and Engineering, 1 course.
   5101, Seminar, 1 course.
   5428, GIS in Natural Science and Engineering, 1 course.
   GEOL 1101, Physical Geology Laboratory, 39 courses.
   GEOL 3322, Oceanography, 4 courses.
   GEOL 4001, Problems in Geosciences, 1 course.
   GEOL 4300, Independent Studies in Geology, 2 courses.
   GEOL 4312, Undergraduate Research, 10 courses.
   GEOL 4324, Geology of Hydrocarbons, 1 course.
   GEOL 4332, Spatial Data Analysis and Modeling in Geosciences, 4 courses.
   GEOL 5001, Problems in Geosciences, 1 course.
   GEOL 5101, Seminar, 4 courses.
   GEOL 5300, Individual Studies in Geology, 3 courses.
   GEOL 5342, Spatial Data Analysis and Modeling in Geosciences, 4 courses.
   GEOL 6000, Master's Thesis, 15 courses.
GEOL 7000, Research, 22 courses.
GEOL 8000, Doctor's Dissertation, 4 courses.
GPH 2333, Introduction to Geophysics, 3 courses.
GPH 3300, Geophysics, 2 courses.

Directed Student Learning

Nur Khaled Chowdhury, Dissertation Committee Member, Geosciences. (September 1, 2014 - Present).

Robert Placek, Master's Thesis Committee Chair, "ocean-continent boundary in the eastern Gulf of Mexico," Geosciences. (September 1, 2014 - Present).

Zachary Wilson, Master's Thesis Committee Chair, "geothermal gradients in the Louisiana continental shelf," Geosciences. (September 1, 2014 - Present).

Clyde Barbian, Master's Thesis Committee Member, "multiple S phases of seismic waves through the mantle," Geosciences. (January 1, 2013 - Present).

Caroline Badger, Master's Thesis Committee Chair, "quartz cementation of sandstone reservoirs in the Gulf of Mexico," Geosciences. (September 1, 2011 - Present).

Alex Dotzer, Master's Thesis Committee Member, "receiver function analysis of the seismic waves in the pacific," Geosciences. (September 1, 2013 - December 2015).


Aaron Watters, Master's Thesis Committee Member, Geosciences. (September 1, 2012 - June 30, 2014).

Zachary Wilson, Undergraduate Research, "thermal conductivity and porosity of sedimentary rocks in the Gulf of Mexico," Geosciences. (September 1, 2013 - May 15, 2014).


Xinwei Huang, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - December 15, 2013).

Kenneth Rogers, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - August 15, 2013).

Luchen Li, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - August 15, 2013).

Mark Knuppel, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - August 15, 2013).

Thomas Harrington, Master's Thesis Committee Member, Geosciences. (September 1, 2011 - May 15, 2013).


Crystal Pate, Master's Thesis Committee Member, "Textural analysis of FMI logs," Geosciences. (September 1, 2010 - August 15, 2012).


Ayobami Oyediji, Master's Thesis Committee Co-Chair, "Lithofacies and sequence stratigraphy of the Fredericksburg group," Geosciences. (September 1, 2008 - December 31, 2011).


RESEARCH
Published Intellectual Contributions

Abstract


Conference Proceeding


**Journal Article, Academic Journal**


**White Paper**

Presentations Given


Nagihara, S., PBS-SEPM Technical Luncheon, Permian Basin Section of SEPM, Midland. (May 2010).


Clark, P. E. (Presenter & Author), Boyle, R. (Author Only), Ku, J. (Author Only), Beaman, B. G. (Author Only), Rogers, R. D. (Author Only), Smiglak, M. (Author Only), Nagihara, S. (Author Only), Knowles, G. (Author Only), Bradley, M. (Author Only), Milam, M. B. (Author Only), Annual Meeting of the Lunar Exploration Analysis Group, "Geothermal system designs for
lunar surface environment science activities," Lunar and Planetary Institute, Houston, TX. (November 18, 2009).


Media Contributions

TV

FOX 34. (March 11, 2011).

Contracts, Grants and Sponsored Research

Grant

Nagihara, S. (Principal), "Processing and addition of high-order ALSEP data products and metadata to the Planetary Data System," Sponsored by Ntl Aeronautics & Space Administration, $146,258.00. (July 1, 2015 - June 30, 2017).


SERVICE

University Service
Committee Member, PoWERS-STRIDE. (September 1, 2009 - August 31, 2010).

**College Service**

Faculty Mentor, New faculty mentors. (August 1, 2009 - August 31, 2010).

**Department Service**

Committee Member, Geophysics faculty search committee. (October 1, 2014 - May 2015).

Degree Program Coordinator. (January 1, 2011 - August 31, 2014).

Degree Program Coordinator. (January 1, 2011 - August 31, 2014).

Committee Member, Sedimentary geology search committee. (October 1, 2010 - May 31, 2011).

Committee Member, Graduate Committee. (September 1, 2006 - December 31, 2010).

Committee Chair, geoscience - geography curriculum. (October 1, 2009 - August 31, 2010).

Committee Member, TracDat data entry. (March 1, 2009 - August 31, 2010).

**Professional Service**

Committee Chair, NASA Apollo Lunar Surface Experiments Package Data Recovery Focus Group. (March 2013 - Present).

Committee Member, Astrogeology Committee - American Association of Petroleum Geologists, Tulsa, OK. (September 1, 2008 - Present).

Reviewer, Panel Under, NASA. (June 2015 - December 2015).

Reviewer, Panel Under, NASA. (February 1, 2015 - February 27, 2015).


Reviewer, Grant Proposal, National Aeronautics and Space Administration, Washington, DC. (September 1, 2011 - September 30, 2011).

Workshop Organizer, Apollo Lunar Surface Experiments Package Data Recovery Focus Group, The Woodlands, TX. (March 8, 2011).


Proposal Review Panel Member, National Aeronautics and Space Administration, Washington, DC. (June 2010).

Reviewer, Journal Article, American Geophysical Union. (April 2010).

Public Service

Guest Speaker, Upward Bound, Lubbock, TX. (November 2010).

GENERAL

Licensures and Certifications


Professional Memberships


American Geophysical Union. (1987 - Present).
Education and Post Graduate Training

Ph D, University of Nebraska, 1997.
  Major: Geology / Geochemistry
  Dissertation Title: The complexation of aluminum and cadmium with sulphate and malonic acid: results of potentiometric and solubility studies

MS, University of Cape Town, 1992.
  Major: Geology

  Major: Geology

BS, University of Cape Town, 1987.
  Major: Geology

Academic and Professional Experience

Professor, Texas Tech University. (September 1, 1998 - Present).

TEACHING

Courses Taught

Texas Tech University
  5405, Inorganic Geochemistry, 1 course.
  GCH 3303, Introduction to Geochemistry, 6 courses.
  GCH 4405, Inorganic Geochemistry, 2 courses.
  GCH 5305, Environmental and Aqueous Geochemistry, 2 courses.
  GCH 5405, Inorganic Geochemistry, 4 courses.
  GEOL 1101, Physical Geology Laboratory, 27 courses.
  GEOL 3323, Environmental Geology, 4 courses.
  GEOL 4001, Problems in Geosciences, 1 course.
  GEOL 4300, Independent Studies in Geology: Environmental Geochemistry, 4 courses.
  GEOL 4312, Undergraduate Research, 7 courses.
  GEOL 5001, Problems In Geosciences:Inorganic Geochemistry, 2 courses.
  GEOL 5300, Indiv Stds In Geology: Interface Geochemistry, 6 courses.
  GEOL 6000, Master's Thesis, 11 courses.
  GEOL 7000, Research, 16 courses.
  GEOL 8000, Doctor's Dissertation, 4 courses.

Directed Student Learning

Yue Li, Dissertation Committee Member, Civil & Environmental Engineering. (January 2015 - Present).

Rachel Owens, Undergraduate Research, Geosciences. (September 2014 - Present).

Charlie Keracik, Master's Thesis Committee Member, Geosciences. (August 2014 - Present).

Sankar Sasidharan, Master's Thesis Committee Chair, Geosciences. (August 2013 - Present).

Kyle Falk, Master's Thesis Committee Member, Geosciences. (August 2013 - Present).

Changjie Liu, Dissertation Committee Member, Geosciences. (January 2013 - Present).

Yue Li, Master's Thesis Committee Member, Civil & Environmental Engineering. (August 2013 - December 2014).


James Green, Dissertation Committee Member, "Dissolution, translocation, and precipitation of sulfate in gysiferous soils using stable isotopes and ion chemistry.," Plant & Soil Science. (August 2010 - August 2014).

Heather Williams, Undergraduate Research, Geosciences. (October 2012 - May 2014).

Jennifer Riedel, Master's Thesis Committee Chair, Geosciences. (January 2012 - May 2014).

Stanley Hensley, Master's Thesis Committee Member, Geosciences. (September 2011 - May 2014).

Jared Stoffel, Master's Thesis Committee Chair, Geosciences. (August 2011 - May 2014).

Jessica Quintanilla, Master's Thesis Committee Member, Geosciences. (September 2011 - December 2013).

Ellen Dailey, Undergraduate Research, Geosciences. (April 2012 - May 2013).


Jian Zhou, Master's Thesis Committee Chair, "Chemical and mineralogical analyses of contaminated soils at the Anaconda Smelter Site, Montana.," Geosciences. (August 2011).

Philip O'Brian, Undergraduate Research, "H+ sorption on rutile surfaces in LiCl media.," Geosciences. (August 2010 - May 2011).

Balaji Anandha Rao, Dissertation Committee Member, Civil & Environmental Engineering. (December 2010).
Kartik Venkataraman, Dissertation Committee Member, "Perchlorate in natural samples from arid environments," Civil & Environmental Engineering. (December 2010).

**RESEARCH**

**Published Intellectual Contributions**

**Journal Article, Academic Journal**


**Presentations Given**


Williams, L. H. (Presenter & Author), Ridley, M. (Author Only), Geological Society of America, "Surface charge development at the barite-water interface in NaCl media, from 15 to 50 °C.," Fayetteville, AR. (March 2014).


Kubicki, J. D. (Presenter & Author), Kim, S.-Y., van Duin, A. C., Ridley, M., Machesky, M., Hummer, D., Kent, P. R., Goldschmidt, "Modeling of TiO2 nanoparticles interactions with water and salt," Florence, Italy. (August 2013).


Ridley, M., Kubicki, J., Macheksy, M., Goldschmidt, "Ion adsorption on nanocrystalline anatase surfaces: Integrating experimental and theoretical studies through surface complexation modeling.," Montreal, Canada. (June 2012).


Wesolowski, D., Machesky, M., Ridley, M., Predota, M., Goldschmidt, "Temperature, charge and radius dependence of multivalent cation adsorption on rutile (α-TiO2) in aqueous 1:1 electrolytes.," Montreal, Canada. (June 2012).


Ridley, M., "Inner-sphere complexation of cations at the rutile–water interface: A concise surface structural interpretation with the CD and MUSIC model.," The Pennsylvania State University, Department of Geosciences, State College, PA. (November 2011).


Protonation and Ion Adsorption at Metal Oxide Surfaces," Prague, Czech Republic. (August 2011).


Wesolowski, D., Machesky, M., Lvov, S., Predota, M., Ridley, M., Cummings, P., Goldschmidt, "On the temperature dependence of mineral surface protonation and ion adsorption reactions.," Knoxville, TN. (June 2010).


Ridley, M., "Surface Phenomena of Nanoparticles in the Environment: A Surface Structural Interpretation of the Nanocrystalline Anatase - Aqueous Solution Interface.," Baylor University, Department of Geology, Waco, TX, USA. (September 25, 2009).
Contracts, Grants and Sponsored Research

Grant


Sponsored Research

Ridley, M. (Principal), Kubicki, J. (Co-Principal), Machesky, M. (Co-Principal), "Ion adsorption on nanocrystalline mineral surfaces: Towards a fundamental understanding of nanoparticles in the environment," Sponsored by National Science Foundation, Federal, $532,774.00. (October 1, 2009 - September 30, 2014).


Ridley, M., "Imaging and Characterization of 4nm Titanium Oxide Nanoparticles," Sponsored by Oak Ridge National Laboratory, Other. (December 31, 2009).

Research in Progress


SERVICE

University Service

Committee Member, Office of the Vice President for Research, Institutional Laboratory Safety Committee. (August 2013 - Present).

Faculty Mentor, Office of the Vice President for Research, Faculty Proposal Development Program. (2010 - 2011).

Committee Member, Search Committee for the Dean of the College of Arts and Sciences. (2009 - 2010).
College Service

Committee Member, College of Arts and Sciences Natural and Physical Sciences Research Council. (2010 - 2013).

Committee Member, College of Arts and Science Scholarship Committee. (February 2013 - May 2013).

Committee Member, College of Arts and Sciences Faculty Awards Committee. (January 2011 - December 2012).

Committee Member, Tenure and Promotion. (September 1, 2007 - August 31, 2010).

Department Service

Faculty Mentor. (August 2014 - Present).

Associate Chair. (2009 - Present).

Committee Chair, Departmental Tenure and Promotion Committee. (August 2015 - October 2015).

Committee Member, Geosciences Faculty Search Committee: for faculty member in Sedimentology. (October 2014 - May 2015).

Committee Chair, Departmental Comprehensive Performance Evaluation Committee. (January 2015 - April 2015).

Committee Member, Geosciences Search Committee: for a Research Associate position for an Electron Microscopist. (2014).

Faculty Mentor. (2011 - 2014).

Committee Member, Departmental tenure and promotion committee. (August 2013 - October 2013).

Committee Chair, Departmental committee to revise the department's guidelines for tenure and promotion. (January 2013 - May 2013).

Committee Chair, Third-year review committee of tenure track Assistant Prof. (January 2011 - March 2011).

Committee Member, Search Committee, Department of Chemical Engineering. (2008 - 2009).

Professional Service


Reviewer, Grant Proposal, National Science Foundation. (2014).
Reviewer and Panelist, National Science Foundation (multiple). (2013).
Reviewer, Ad Hoc Reviewer, University of New Mexico, Gallup. (2013).
Reviewer, Grant Proposal, National Science Foundation (multiple). (2012).
Officer, Secretary, Sigma Xi. (2010 - 2011).
Reviewer, Ad Hoc Reviewer, National Institute of Standards and Technology (multiple). (2010).
Reviewer, Grant Proposal, National Science Foundation (multiple). (2009).

Review Panel Member, National Science Foundation, Washington, DC. (November 18, 2009 - November 20, 2009).

GENERAL

Professional Memberships

American Chemical Society.

American Geophysical Union.

Geochemical Society.

Geological Society of America.

Sigma Xi.
Dr. Cindy L. Sorrensen  
Texas Tech University  
cynthia.sorrensen@ttu.edu

Education and Post Graduate Training

Ph D, Ohio State University, 1998.  
Major: Geography  
Dissertation Title: Biomass Burning in Tropical Ecosystems: An Analysis of Secondary Succession, Land Settlement and Land Use Practice to Assess Burning Patterns in the Brazilian Lower Amazon

MA, Ohio State University, 1994.  
Major: Geography  
Dissertation Title: A Micro-Regional Analysis of Land Use Trends in Ecuador: Implications for Environmental Studies and Natural Disasters.

BA, University of Redlands, 1985.  
Major: Dance  
Supporting Areas of Emphasis: Math

Academic and Professional Experience

Assistant Professor, Texas Tech University. (August 2006 - Present).

TEACHING

Courses Taught

Texas Tech University
GEOG 1300, Fundamentals of Geography, 4 courses.  
GEOG 1401, Physical Geography, 3 courses.  
GEOG 2351, Regional Geography of the World, 4 courses.  
GEOG 3301, Remote Sensing of the Environment, 2 courses.  
GEOG 3363, Geography of South America, 3 courses.  
GEOG 4300, Seminar in Geography, 3 courses.  
GEOG 4369, Ind Research In Geography, 5 courses.  
GEOG 5301, Remote Sensing of the Environment, 2 courses.  
GEOG 5303, Advanced Human Geography, 5 courses.  
GEOG 5310, Readings in Geography, 3 courses.  
GEOG 5312, Seminar in Geographic Thought, 1 course.  
GEOG 5320, Special Topics in Geography, 1 course.  
GEOG 6000, Master's Thesis, 3 courses.  
GEOG 7000, Research, 1 course.  
LAIS 2300, Latin America and Iberia: An Interdisciplinary Introduction, 2 courses.  
LAIS 3300, "Contemporary Development in South America", 1 course.

Directed Student Learning

Cullen Dunkerson, Master's Thesis Committee Member, "Why They Stay: Place Rootness in Moore, Oklahoma," Geosciences. (January 2013 - Present).


Jack Phelps, Master's Thesis Committee Member, Geosciences. (August 2012 - December 2012).


**RESEARCH**

**Published Intellectual Contributions**

**Book, Chapter in Scholarly Book-New**


**Educational Review of Cinema**


**Journal Article, Academic Journal**


**Presentations Given**


Sorrensen, C. (Presenter & Author), Regional meeting, Southwest Division of the American Association of Geographers, "In bits and pieces; small town flooding and big time hazardscapes in the US Mexico borderlands," Southwest Division of the American Association of Geographers, North Little Rock, AK. (October 2009).

Contracts, Grants and Sponsored Research

Grant

Sorrensen, C. (Principal), "Ex-Urban Growth and a History of Fire Hazard in the American West," Sponsored by VP for Research: Creative Arts, Humanities and Social Sciences Competition, Texas Tech University, $9,600.00. (November 2011 - August 2012).


Guengerich, S. (Principal), Brittsan, Z. (Co-Principal), Gring, M. (Co-Principal), Elola, I. (Co-Principal), Sorrensen, C. (Co-Principal), Scarborough, C., Perez, A., "Mini-Grant," Sponsored by Humanities Texas, State, $750.00. (January 1, 2011 - March 30, 2011).

Intellectual Contributions in Submission

Book, Chapter in Scholarly Book-New


Journal Article, Academic Journal

Sorrensen, C. Exploring the Articulation of Surface to Subsurface Landscapes: The Spatial Politics of Tunneling under the U.S. Mexico Border. \textit{Political Geography/Elsevier}.

Sorrensen, C. Using Spatial Analysis to Explore Landscape Surface Dynamics and Underground Cross Border Tunnels. \textit{Professional Geographer}.

Research in Progress

"Subterranean geographies: Security politics and environmental impacts of narco tunnels in the U.S.-Mexico borderlands" (On-Going).
"Environmental amenities, ethnicity and cities in the South Plains" (On-Going). (August 2014 - Present).

Research Interests

true, Cultural Geography, Political Geography, Social Geography, Human Dimensions of Global Environmental Change; Political Ecology; Latin America

SERVICE

University Service

Treasurer, Phi Beta Kappa. (January 2010 - December 2011).

College Service

Committee Member, Scholarship Committee. (February 2011 - March 2011).

Professional Service

Editor, Journal Editor, Southwest Division of the American Association of Geographers. (October 2009 - October 2011).

GENERAL

Consulting


Professional Memberships


Co-Editor of The Southwestern Geographer Journal, Southwest Division of the American Association of Geographers. (August 2006 - Present).


Association of Pacific Coast Geographers. (August 2012 - August 2013).
Education and Post Graduate Training

Ph D, University of Oklahoma, 2009.
  Major: Geology
  Dissertation Title: Glaciation in Equatorial Pangaea: Testing the hypothesis in the
  Pennsylvanian-Permian Fountain Formation (Colorado)

MS, Boise State University, 2003.
  Major: Geology
  Dissertation Title: Late Paleozoic Tectonostratigraphy of the Central Pequop Mountians, Elko
  County, Nevada

BS, Boise State University, 2000.
  Major: Geology
  Dissertation Title: Jurassic Sedimentary sequence in the Izee Terrane, Western Idaho

Academic and Professional Experience

Assistant Professor, Texas Tech University. (August 15, 2011 - Present).

  Worked as an exploration and new ventures geologist in west African basins.

TEACHING

Courses Taught

Texas Tech University
  GEOL 1101, Physical Geology Laboratory, 21 courses.
  GEOL 4001, Problems in Geosciences, 1 course.
  GEOL 4312, Undergraduate Research, 8 courses.
  GEOL 4325, Sedimentology and Stratigraphy, 10 courses.
  GEOL 5001, Problems in Geosciences: Hydrocarbon Exploration Methods, 4 courses.
  GEOL 5101, Seminar:Ancestral Rocky Mountains, 1 course.
  GEOL 5300, Individual Studies in Geology: Sedimentology and Stratigraphy, 4 courses.
  GEOL 5322, Sedimentary Processes, 2 courses.
  GEOL 5422, Sedimentary Geology of Carbonates, 5 courses.
  GEOL 5426, Sequence Stratigraphy, 8 courses.
  GEOL 6000, Master's Thesis, 9 courses.
  GEOL 7000, Research, 9 courses.

Non-Credit Instruction

  Workshop, Institute for the Development and Enrichment of Advanced Learners, 10 participants.
  (June 15, 2015 - June 18, 2015).
Directed Student Learning

Zachary Wilson, Master's Thesis Committee Member, Geosciences. (August 25, 2015 - Present).


Eric Friedman, Master's Thesis Committee Chair, "Comparing siliciclastic content of a ramp to rimmed carbonate slope during relative sea level highstands," Geosciences. (August 24, 2015 - Present).


Jill Garcia, Master's Thesis Committee Chair, "Late Paleozoic structure and sediment delivery of the Midland, Delaware and Palo Duro basins revealed through regional scale structure and isopach maps." (August 24, 2015 - Present).

Josh Newton, Undergraduate Research, Geosciences. (August 24, 2015 - Present).

Seth Martin, Undergraduate Research, Geosciences. (August 24, 2015 - Present).

Sterling Lepard, Undergraduate Research, Geosciences. (August 24, 2015 - Present).

Jennifer Kohn, Master's Thesis Committee Member, Geosciences. (January 15, 2015 - Present).

Jacob Cobb, Master's Thesis Committee Member, Geosciences. (November 20, 2014 - Present).


Jenna Hessert, Master's Thesis Committee Member, Geosciences. (August 19, 2014 - Present).


Phil Frederick, Doctoral Advisory Committee Co-Chair, "Stratigraphy and paleogeography of the Peratrovich Formation and Ladrone Limestone (Mississippian to Pennsylvanian) southeastern Alaska," Geosciences. (January 1, 2014 - Present).

Kenneth Cassady, Master's Thesis Committee Member, Geosciences. (April 15, 2013 - Present).


Kaitlyn Andreas, Master's Thesis Committee Member, "Understanding naturally fractured reservoir mechanics by studying the geometries and kinematics of gypsum-filled fractures in the Pennsylvanian strata of Caprock canyon State Park, Texas, USA," Geosciences. (January 15, 2015 - July 6, 2015).

David Brannan, Master's Thesis Committee Chair, "Fluvial overprinting of glacially induced microtextures on quartz grains derived from the Chitina Glacier, Alaska," Geosciences. (June 1, 2013 - July 6, 2015).


David Manoukian, Master's Thesis Committee Member, Geosciences. (April 15, 2013 - May 7, 2015).


Aaron Watters, Master's Thesis Committee Chair, "Middle Pennsylvanian Paleogeography of the Taos Trough Region, Northern New Mexico," Geosciences. (September 1, 2012 - June 24, 2014).

Cory Christie, Master's Thesis Committee Member, Geosciences. (September 1, 2012 - May 20, 2014).


Ashley Saelens, Master's Thesis Committee Member, Geosciences. (April 1, 2013 - May 9, 2014).


Corbin Carsrud, Undergraduate Research, "A Pennsylvanian Age for the Fountain Formation constrained by lithologic comparison of overlying eolian units," Geosciences. (February 9, 2012 - May 7, 2013).


RESEARCH
Published Intellectual Contributions

Abstract


**Journal Article, Academic Journal**


Journal, Edited Issue


Presentations Given

Sweet, D., Monthly Climate Science Center Meeting, "Pleistocene climatic conditions archived in paleosols of the Southern High Plains," Texas Tech University. (March 3, 2015).

Sweet, D. (Presenter & Author), Department Seminar, "The Ancestral Rocky Mountains: New Perspectives on an Enigmatic Orogenic Event," University of Texas-Dallas, Richardson, TX. (October 18, 2013).


Media Contributions

Radio

KTXT Arts & Sciences Radio Spot. (November 18, 2014).

Contracts, Grants and Sponsored Research

Sponsored Research


Intellectual Contributions in Submission

Journal Article, Academic Journal


Research Interests

true, Energy Exploration or Reserves, Geology, Sedimentology, Stratigraphy, Weathering

SERVICE
Department Service

Faculty Mentor, Imperial Barrel Award Competition. (December 11, 2014 - Present).

Committee Member, Sedimentary Assistant Professor Search Committee. (November 1, 2014 - Present).

Event Organizer, Geosciences Research Day Coordinator. (January 1, 2014 - Present).

Committee Member, Pevehouse Chair search committee. (August 2012 - March 2014).

Professional Service


Session Chair, Geological Society of America, Denver, Colorado. (November 1, 2012 - October 26, 2013).

NSF Workshop, National Science Foundation, Salt Lake City, Utah. (March 24, 2013 - March 26, 2013).


GENERAL

Professional Memberships

Sigma Xi_The Scientific Research Society. (June 1, 2005 - Present).

SEPM_Society for Sedimentary Geology. (May 1, 2004 - Present).

Geologic Society of America. (April 1, 1999 - Present).

Development Activities Attended
Education and Post Graduate Training

Ph D, Washington University, 1984.
Major: Geochemistry
Supporting Areas of Emphasis: Geology
Dissertation Title: Petrology and Geochemistry of Mafic Rocks, St. Francois Mountains, Missouri, USA

BS, Purdue University, 1979.
Major: Geology
Supporting Areas of Emphasis: Geochemistry

Academic and Professional Experience

Full Professor, Memorial University of Newfoundland. (September 1, 2004 - August 20, 2014).
Teaching and Research in the Geosciences

TEACHING

Courses Taught

Texas Tech University
GCH 5300, Indiv Stds In Geochem: Sedimentary Provenance, 2 courses.
GCH 5360, Radiogenic Isotope Geochemistry, 1 course.
GEOL 7000, Research, 3 courses.

Directed Student Learning

Angela Norman, Master's Thesis Committee Chair, "Mineralogy and provenance of Iceland black sands," Geosciences. (January 10, 2015 - Present).

Matthew Scott, Master's Thesis Committee Co-Chair, "Provenance, texture and mineralogy of hydrocarbon source rocks, Central Ridge and Flemish Pass basin, offshore Newfoundland," Geosciences. (September 1, 2012 - Present).

Michelle Kelvin, Master's Thesis Committee Chair, "Precious metal geochemistry and mineralogy of the Voisey's Bay Magmatic Sulfide Deposit, Labrador, Canada," Geosciences. (September 1, 2011 - Present).

Stefanie Brueckner, Doctoral Advisory Committee Co-Chair, "Syngenetic precious metal enrichment in an Appalachian volcanogenic massive sulfide system: The 1806 Zone, Ming Mine, Newfoundland, Canada," Geosciences. (January 1, 2010 - Present).


RESEARCH

Published Intellectual Contributions

Journal Article, Academic Journal


Presentations Given


Contracts, Grants and Sponsored Research

Grant

Barnes, C. G. (Principal), Hetherington, C. (Co-Principal), Yoshinobu, A. (Co-Principal), Sylvester, P. (Co-Principal), "Subcretion versus relamination: testing processes of lower crustal modification in the Klamath Mountain accretionary province," Sponsored by NSF, Texas Tech University, $350,001.00. (June 1, 2016 - May 31, 2019).

SERVICE

Department Service

Committee Chair, Search committee for sedimentary systems faculty position. (October 7, 2014 - Present).

Professional Service

Editorial Review Board Member, Geostandards and Geoanalytical Research, Vandoeuvre-les-Nancy Cedex. (January 1, 2014 - Present).


Session Chair, 4th Atlantic Conjugate Margins Conference, St. Johns, Newfoundland. (August 21, 2014).

Public Service

Education and Post Graduate Training

Ph D, University of California, Los Angeles, 1969.
Major: Geography
Dissertation Title: Geographical Aspects of Water Law in the Nueces River Basin, Texas

MA, Southern Methodist University, 1964.
Major: Geography
Dissertation Title: Matagorda Bay, Texas: Its Economy in Relation to Port and Waterway Development

JD, University of Texas School of Law, 1959.
Major: Law, Member State Bar of Texas since 1959

BS, Texas A&M University, 1954.
Major: Agriculture (Horticulture)

Academic and Professional Experience

Professor (Retired, part-time, 2001-present), Texas Tech University. (September 2001 - May 2011).
Part-time instructor since my retirement in May, 2001, one course per semester.

Leadership Awards and Honors

Dean’s List, Southern Methodist University.

Distinguished Student, A & M College of Texas.

Phi Alpha Delta Law Fraternity, University of Texas.

Phi Eta Sigma Honor Society, A & M College of Texas.

Phi Kappa Phi Honor Society, A & M College of Texas.

Society of Sigma Xi, Texas Tech University.

Endowment Gifts

Endowment, 10,000.00, Otis & Josephine Templer Geography Scholarship Endowment, This is a matching gift to the Texas Tech Foundation, Inc. to increase the amount of the above named scholarship endowment. (December 16, 2011).

TEACHING

Courses Taught
Texas Tech University
3353, Man, Resources and Environment, 1 course.
5304, Advanced Physical Geography, 2 courses.
GEOG 3352, Geography of US and Canada, 6 courses.
GEOG 3353, Man, Resources, and Environment, 5 courses.
GEOG 4369, Independent Research in Geography, 1 course.
GEOG 5303, Advanced Human Geography, 3 courses.
GEOG 5304, Advanced Physical Geography: Man, Resources & Environment, 4 courses.
GEOG 5310, Readings in Geography, 1 course.
GEOG 7000, Research, 1 course.

RESEARCH

Published Intellectual Contributions

Journal Article, Academic Journal


Research Interests

true, Study of the legal/political and spatial problems confronting water resource development, use, and management in Texas and arid and semiarid lands.

Primary Fields of Interest:

Water Resources (especially analysis of the institutional [legal-political] and spatial aspects of water resource development, use, and management, and water policy in arid and semi-arid lands).
Geography of Arid and Semi-Arid Lands
Interaction of Mankind with Arid and Semi-Arid Environments
Geography of Viticulture/Viniculture in Texas and the American Southwest

Secondary Interests:

Environmental Studies

SERVICE

University Service

Committee Member, ICASALS Associate. (1981 - Present).

Professional Service

Reviewer, Journal Article, Association for Arid Lands Studies.

Public Service

American Geographical Society.
American Water Resources Association.
Association for Arid Lands Studies.
Association of American Geographers (Life Member).
Association of Borderlands Scholars.
Gamma Theta Upsilon.
Phi Kappa Phi.
Retired Geographers Organization.
Society of Sigma Xi.
Southwestern Social Science Association.
Universities Council on Water Resources (Delegate from TTU).
Western Social Science Association.
State Bar of Texas. (1959 - Present).

**GENERAL**

**Licensures and Certifications**

Attorney at Law (Non-law related employment), State Bar of Texas. (April 1959 - Present).

**Professional Memberships**

American Geographical Society.
American Water Resources Association.
Association for Arid Lands Studies.
Association of American Geographers (Life Member).
Gamma Theta Upsilon.
National Council for Geographic Education.
Phi Kappa Phi.
Society of Sigma Xi.
Southwestern Social Science Association.
State Bar of Texas and Section on Environmental and Natural Resource Law.
Western Social Science Association.
Dr. Jenni K. Vanos  
Texas Tech University  
(806) 834-3319  
jennifer.vanos@ttu.edu

**Education and Post Graduate Training**

Major: Environmental Health Science Research Bureau  
Supporting Areas of Emphasis: Population Studies, Human Biometeorology

Ph D, University of Guelph, 2011.  
Major: Atmospheric Sciences  
Supporting Areas of Emphasis: Human Biometeorology  
Dissertation Title: Modelling outdoor thermal comfort of humans performing physical activity: applications to health and emergency heat stress preparedness

Bacherlor of Science in Environmental Science, University of Guelph, 2008.  
Major: Earth and Atmospheric Sciences  
Supporting Areas of Emphasis: Environmental Degradation

**Academic and Professional Experience**

**Assistant Professor, Texas Tech University. (August 15, 2013 - Present).**  
Teaching undergraduate and graduate courses; research in Atmospheric and Climate Sciences;  
Climate Science Center Affiliate Faculty;  
National Wind Institute Affiliate Faculty.

**Research Consultant, Applied Climatologists, Inc. (December 1, 2011 - August 15, 2013).**  
Complete minimal amounts of consulting work for the company when expertise is needed.

**Visiting Research Scientist, University of Miami. (February 2013 - June 2013).**  
Completed studies in the Department of Geography for the Synoptic Climatology Lab in spatial synoptic climatology, climate and health, and human biometeorology.

**Post Doctoral Research Scientist, Health Canada. (January 1, 2012 - December 31, 2012).**  
Completed scientific studies in human biometeorology, air effects health, environmental epidemiology, and applied synoptic climatology for the Government of Canada, in Ottawa, Ontario.

**PhD Student, University of Guelph. (September 2008 - November 2011).**

**TEACHING**

**Courses Taught**

**Texas Tech University**  
ATMO 1100, Atmospheric Science Laboratory, 15 courses.  
ATMO 1300, Introduction to Atmospheric Science, 2 courses.  
ATMO 2301, Weather, Climate, and Human Activities, 2 courses.  
ATMO 4300, Independent Studies in Atmospheric Science, 2 courses.  
ATMO 4312, Undergraduate Research, 2 courses.
ATMO 5302, Weather, Climate, and Applications, 1 course.
ATMO 6000, Master's Thesis, 7 courses.
ATMO 7000, Research, 7 courses.

Non-Credit Instruction

Guest Lecture, Texas A&M University, 12 participants. (September 12, 2014 - Present).

Research Course, Umea University & Centre for Global Health Research, 16 participants. (June 1, 2015 - June 12, 2015).

Guest Lecture, TTU Honors College: Equatorial Climates & Weather: From large scale interactions to microscale impacts, 20 participants. (October 14, 2014 - October 15, 2014).


Research Course, Umea University & Centre for Global Health Research, 16 participants. (June 1, 2014 - June 12, 2014).

Continuing Education, Osher Lifelong Learning Institute, 30 participants. (April 30, 2014).

Directed Student Learning

Xing Zhou, Undergraduate Research, Geosciences. (August 21, 2015 - Present).

Lexie Herdt, Master's Thesis Committee Chair, Geosciences. (August 15, 2015 - Present).

Grant McKercher, Master's Thesis Committee Chair, Geosciences. (August 16, 2014 - Present).

Kelly Neely, Master's Thesis Committee Chair, Geosciences. (August 16, 2014 - Present).

Vijendra Ingole, Qualifying Exam Committee Member, "A study of weather effects, susceptibilities and potential impacts of climate change on mortality in Vadu (HDSS), Western India," Other (Outside Texas Tech University). (June 2014 - Present).

Ying Liu, Dissertation Committee Member, Geosciences. (2013 - Present).

Aaron Hardin, Master's Thesis Committee Chair, Geosciences. (August 15, 2013 - June 2015).


Multiple Students in group, Undergraduate Research, "Development of Portable Air Pollution Sensor." (January 2015 - May 2015).


Drew Graham, Dissertation Committee Member, "Census tract-level outdoor thermal comfort modeling and heat-related morbidity analysis during extreme heat events in Toronto: the impact of design modification to the urban landscape," Landscape Architecture. (September 2009 - August 2012).

RESEARCH

Artistic and Professional Performances and Exhibits


Published Intellectual Contributions

Glossary Published by Journal


Journal Article, Academic Journal


Christopher, H., Cakmak, S., Vanos, J. Using spatial and land use regression models in investigating the modifying effect of socioeconomic status on the interaction between traffic, air pollution and asthma. Environmental Pollution.


**Research Report**


**Thesis**

Presentations Given


Vanos, J. (Presenter & Author), International Congress of Biometeorology, "Extending the application of climate and health research tools into distinct climate regimes in India, Sweden, and New Zealand: Sweden workshop report," AMS, Cleveland, Ohio. (October 1, 2014).


Vanoss, J. (Presenter & Author), Climate Change and Health: Research Methods, "Air Quality and Climate Change," Umeå Center for Global Research, Umeå University, Umeå, Sweden. (June 11, 2014).

Vanoss, J. (Presenter & Author), Climate Change and Health: Research Methods, "Assessing past & current climate effects and impacts: Air Pollution & Health Assessments," Umeå Center for Global Research, Umeå University, Umeå, Sweden. (June 6, 2014).

Vanoss, J. (Presenter & Author), Climate Change and Health: Research Methods, "Heat Warning Systems," Umeå Center for Global Research, Umeå University, Umeå. (June 5, 2014).

Vanoss, J. (Presenter & Author), Climate Change and Health: Research Methods, "Assessing past and current climate effects and impacts: Heat and health assessments," Umeå Center for Global Research, Umeå University, Umeå. (June 4, 2014).

Vanoss, J. (Presenter & Author), Climate Change and Health: Research Methods, "Working with meteorological datasets, current and future," Umeå Center for Global Research, Umeå University, Umeå. (June 3, 2014).


Vanos, J. (Presenter & Author), 10th Annual Conference on Advancing Teaching and Learning, "Reversing the Roles in the Classroom: Teaching with Guided Participation for Student Led Learning," Texas Tech University, Overton Hotel, Lubbock, TX. (February 28, 2014).


Vanos, J. (Presenter & Author), Cakmak, S. (Author Only), Hebbern, C. (Author Only), American Meteorological Society Annual Meeting, "Risk assessment for cardiovascular and respiratory mortality due to air pollution and synoptic meteorology in 10 Canadian cities," AMS, Atlanta, GA. (February 5, 2014).


Vanos, J. (Presenter & Author), Kalkstein, L. (Author Only), Sanford, T. S. (Author Only), Perera, L. (Author Only), American Meteorological Society Annual Meeting, "Detecting warming trends in the US Midwest using a synoptic climatologically approach.," Austin, TX. (January 9, 2013).


Vanos, J. (Presenter & Author), Sabit, C. (Author Only), Health Canada Science Forum, "Synoptic weather typing applied to air pollution mortality effects on the elderly in 10 Canadian cities.," Health Canada, Ottawa, ON. (December 3, 2012).


Vanos, J. (Presenter & Author), Canadian Meteorological and Oceanographic Society, "Modelling spatial variations in energy budgets of humans exercising in outdoor urban recreational parks and spaces.," CMOS, Victoria, BC. (June 5, 2011).


Vanos, J. (Presenter & Author), Canadian Meteorological and Oceanographic Society, "Modelling skin temperature of a human exercising in an outdoor environment.," CMOS, Ottawa, ON. (May 28, 2010).
Media Contributions

Internet


Wallethub. (July 21, 2014).

weather.com. (June 14, 2014).


Magazine

OZY. (May 7, 2014).

Newspaper

Texas Tribune. (October 21, 2014).

The Daily Toreador. (February 20, 2014).

Pittsburgh Post-Gazette. (January 8, 2014).

TV

Dr. Nandi Show. (July 19, 2014).

Contracts, Grants and Sponsored Research

Grant

Vanos, J. (Principal), "Real-time intra-urban air quality monitoring through the use of mobile platforms," Sponsored by Oakridge Universities, Federal, $10,000.00. (June 1, 2014 - May 31, 2016).

Vanos, J., "Urban Water Innovation Network (U-WIN): Transitioning Toward Sustainable Water Systems," Sponsored by National Science Foundation, Federal, $12,000,000.00. (May 1, 2016 - Present).

Vanos, J. (Principal), "Enhancing the Teaching and Learning of Biometeorology in Higher Education," Sponsored by Tromp Foundation, Other, $15,000.00. (December 2015 - Present).


Vanos, J. (Principal), "Real-time Intra-urban Air Quality Monitoring through the use of Mobile Platforms," Sponsored by Oak Ridge Associated Universities, $5,000.00. (June 1, 2014 - May 31, 2015).
Vanos, J. (Co-Principal), Hondula, D. (Co-Principal), Gosling, S., "Extending the application of climate and health research tools into distinct climate regimes in India, Russia and New Zealand," Sponsored by Tromp Foundation, Other, $15,000.00. (May 2014 - April 2015).

Vanos, J. (Co-Principal), Cao, G. (Principal), Chen, Y. (Co-Principal), “Transdisciplinary Research Academy, Texas Tech,” Texas Tech University, $4,000.00. (March 2015).

Vanos, J. (Co-Principal), Gittner, L. (Principal), Cao, G., "Socio-environmental Factors and Health Inequalities," Sponsored by National Institute of Health, $12,729.00. (February 1, 2015 - Present).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Research in Progress**


"Development of Portable Sensing Technologies for Urban Air Pollution" (On-Going). (January 2015 - Present).

"A Multiscalar Thermal Analysis of Urban Playgrounds" (Writing Results). (September 2014 - Present). Interdisciplinary field research project with researchers at Arizona State University.


"Assessment of outdoor instruments used to measure radiation exposure: Quantifying human characteristics" (Writing Results). (August 2014 - Present).

**SERVICE**

**University Service**


**Department Service**

Committee Member, Search Committee - Climate & Remote Sensing New Hire. (December 1, 2014 - Present).
Professional Service


Editorial Review Board Member, Springer Publishing - Editorial Advisory Board. (June 2014 - Present).


GENERAL

Consulting


Professional Memberships

International Association for Urban Climate. (September 2012 - Present).

American Association of Geographers. (March 2012 - Present).


American Meteorological Society. (January 2010 - Present).

Canadian Meteorological and Oceanographic Society. (September 2008 - September 2013).

Canadian Association of Geographers. (January 2012 - February 2013).

Development Activities Attended

Instructional Diagnosis, "TLPDC Representative Review of Teaching and Meeting," TLPDC, Lubbock, TX. (October 2014 - Present).

TLPDC Representative Review of Teaching and Meeting, "Instructional Diagnosis," TLPDC, Lubbock, TX, USA. (April 3, 2014 - Present).

"TEACH Fellow Series: The Secrets to Our Success (panel discussion)," TLPDC, Lubbock, TX, USA. (September 6, 2013 - Present).

The Faculty Proposal Development Program for first year faculty at Texas Tech, "T.I.P.S The Faculty Proposal Development Program," Office of Research Services, Texas Tech University (Michael San Francisco), Lubbock, TX, USA. (September 2013 - May 2014).

Workshop, "Tenure Academy," Texas Tech, Lubbock, TX, USA. (November 19, 2013).

Workshop, "Spot-on Speaking: Improving Voice Dexterity in the Classroom," TLPDC, Lubbock, TX, USA. (October 17, 2013).


Workshop, "What the Best Teachers Do: Changes I’ve Made to My Teaching," TLPDC, Lubbock, TX, USA. (September 16, 2013).

Conference Attendance, "Graduate Student University Teaching Conference," University of Guelph, Guelph, ON, Canada. (September 2011).

Workshop, "Teaching Support Services, Graduate Student Workshops & Conferences," University of Guelph, GUelph, ON, Canada. (September 2010 - September 2011).
Dr. Christopher C. Weiss  
Texas Tech University  
(806) 834-4712  
chris.weiss@ttu.edu

Education and Post Graduate Training

Ph D, University of Oklahoma, 2004.  
Major: Meteorology  
Dissertation Title: Variational Pseudo Multiple-Doppler Analyses of a Dryline Utilizing Very-High Resolution Mobile Doppler Radar Data

MS, University of Oklahoma, 2000.  
Major: Meteorology  
Dissertation Title: Airborne Doppler Analysis of a Dryline-Outflow Boundary Intersection and Subsequent Convection

BS, University of Michigan, 1997.  
Major: Atmospheric, Oceanic and Space Sciences

Academic and Professional Experience

Associate Professor, Texas Tech University. (September 1, 2010 - Present).

Assistant Professor, Texas Tech University. (August 1, 2004 - August 30, 2010).

TEACHING

Courses Taught

Texas Tech University

1100, Atmospheric Science Lab, 4 courses.
2316, Severe and Hazardous Weather, 1 course.
4300, Independent Studies in Atmospheric Science, 1 course.
5101, Atmospheric Science Seminar, 1 course.
5316, Dynamics of Severe Storms, 1 course.
ATMO 1100, Atmospheric Science Laboratory, 40 courses.
ATMO 1300, Introduction to Atmospheric Science, 2 courses.
ATMO 2316, Severe and Hazardous Weather, 5 courses.
ATMO 4300, Independent Studies in Atmospheric Science, 6 courses.
ATMO 5101, Atmospheric Science Seminar, 11 courses.
ATMO 5316, Dynamics of Severe Storms, 2 courses.
ATMO 5327, Radar Meteorology, 3 courses.
ATMO 6000, Master's Thesis, 24 courses.
ATMO 7000, Research, 23 courses.
GEOL 4312, Undergraduate Research, 1 course.
GEOL 8000, Doctor's Dissertation, 21 courses.
GPH 5324, Radiative Transfer, 1 course.
IS 5000, Graduate Directed Studies, 1 course.

Directed Student Learning
Vanna Sullivan, Dissertation Committee Member. (2015 - Present).

Abby Kenyon, Master's Thesis Committee Chair, Atmospheric Science Group. (2015 - Present).

Aaron Hill, Dissertation Committee Chair. (2014 - Present).

Brock Burghardt, Master's Thesis Committee Member. (2014 - Present).

Timothy Sliwinski, Dissertation Committee Member. (2013 - Present).

Scott Gunter, Dissertation Committee Member. (2012 - Present).

Karen Tarara, Dissertation Committee Member. (2010 - Present).

Anthony Reinhart, Dissertation Committee Chair, Geosciences. (2009 - Present).

Candace Cyrek, Master's Thesis Committee Member, Geosciences. (2008 - Present).


Phillip Ware, Master's Thesis Committee Member. (2014 - 2015).


Jianjun Luo, Dissertation Committee Member. (2014).

Aaron Hill, Master's Thesis Committee Chair. (2012 - 2014).

Timothy Cermak, Master's Thesis Committee Chair. (2012 - 2014).


Cameron Plourde, Master's Thesis Committee Member. (2012 - 2013).

Christopher Bednarczyk, Master's Thesis Committee Member. (2012 - 2013).

Michael Hollan, Master's Thesis Committee Member. (2012 - 2013).

Timothy Sliwinski, Master's Thesis Committee Member. (2012 - 2013).

Vanna Sullivan, Master's Thesis Committee Member. (2012 - 2013).

Patrick Skinner, Dissertation Committee Chair, Civil & Environmental Engineering. (2009 - 2013).

Kate Horgan, Master's Thesis Committee Chair, Geosciences. (2006 - 2013).


Amber Reynolds, Dissertation Committee Chair, "Observational and Modeling Assessment of Transitioning Mesoscale Convective Systems off the Coast of West Africa," Civil & Environmental Engineering. (2009 - 2012).
Brad Charboneau, Master's Thesis Committee Chair, Geosciences. (2009 - 2012).

Ryan Metzger, Master's Thesis Committee Chair, Geosciences. (2009 - 2011).

Brian Hirth, Dissertation Committee Member, "Coastal Transition of the Wind Field of Hurricane Frances," Geosciences. (2008 - 2011).

Scott Gunter, Master's Thesis Committee Member, Geosciences. (2010).

Amanda Thibault, Master's Thesis Committee Member, Geosciences. (2009 - 2010).

Trevor Boucher, Master's Thesis Committee Member, Geosciences. (2009 - 2010).


RESEARCH

Published Intellectual Contributions

Conference Proceeding


Journal Article, Academic Journal


Journal Article, Professional Journal


Newsletter


Presentations Given

Weiss, C., See Conference Proceedings list for additional presentations... (2015).


Weiss, C. (Presenter & Author), University of Michigan AOSS Seminar Series, "Storm-Scale Baroclinity as Revealed by Direct Observations during the VORTEX2 Project," University of Michigan, Ann Arbor, MI. (February 2013).

Ancell, B. (Presenter & Author), Weiss, C. (Author Only), Texas Tech University Libraries' 28th Annual Faculty Contributions Exhibit (FACE), "Integration of Forecast Sensitivity into the NWS Forecasting Process to Improve Predictability of High-impact Weather," Texas Tech University Libraries, Texas Tech University. (October 2012).


Weiss, C., Quarterly Meeting, "Tornadoes: What They Are and What We Are Learning About Them," Osher Lifelong Learning Institute, Lubbock, TX. (September 2010).


Weiss, C., 9th Annual Student Conference, "VORTEX2: A Faculty/Student Partnership," American Meteorological Society, Atlanta, GA. (January 2010).

Media Contributions

Internet

TTU Office of Communications and Marketing. (May 2010).

Newspaper

Dallas Star-Telegram. (May 16, 2013).

LA Times, AP, St. Louis Post-Dispatch. (April 28, 2011).

Other

Texas Tech Yearbook. (October 11, 2009).

Radio

WORT-FM (Madison, WI). (May 21, 2015).


Illinois Farm Bureau Radio Network. (March 2010).

TV

FOX34 (Lubbock). (June 17, 2014).


KTTZ. (April 10, 2014).

NTV Russia. (May 24, 2013).


ABC News with Diane Sawyer. (May 17, 2013).

BBC. (September 20, 2012).


KCBD-TV. (April 15, 2012).

NOVA. (April 12, 2012).

NOVA. (August 20, 2011).

Fox 34 (Lubbock). (August 5, 2011).

The Weather Channel. (May 2010).

NEWS 8 Austin. (January 26, 2010).

Contracts, Grants and Sponsored Research

Grant


Weiss, C. (Co-Principal), "Innovative Technologies to Investigate Fine-Scale Atmospheric Motions and Their Impact," Sponsored by Texas Tech Vice President of Research, Texas Tech University, $1,000,000.00. (2006 - 2009).

**Intellectual Contributions in Submission**

**Journal Article, Academic Journal**


**Journal Article, Professional Journal**


**Research in Progress**

"Convection Initiation" (Planning).
- Studying the dynamics and inherent predictability of convection initiation along Southern Plains drylines.

"Dryline structure and dynamics" (On-Going).
- Understanding along-dryline variability, e.g., misovortices

"Unmanned Aerial Systems" (On-Going).
- Exploring ways in which UAS systems can be used for the study of atmospheric phenomenon

"Verification of the Origin of Rotation in Tornadoes Experiment 2" (On-Going).
- Currently carrying out analysis of data obtained during the 2009 phase of the NSF-sponsored Verification of the Origin of Rotation in Tornadoes Experiment 2. Results are targeted for the AMS Severe Local Storms Conference in Oct 2010. Preliminary results will also be discussed at the Lubbock Severe Weather Conference in February 2010.

**Research Interests**

true, Atmospheric Physics, Atmospheric Remote Sensing, Atmospheric Structure and Dynamics, Meteorology, Precipitation, Weather, Weather Prediction or Forecasting

**SERVICE**

**University Service**

Faculty Advisor, Lutheran Student Fellowship. (2005 - Present).

**College Service**

Committee Member, Texas Tech Graduate Council Representative (Science and Mathematics). (2014 - Present).

**Department Service**

Committee Member, Internal Advisory Board - National Wind Institute. (January 15, 2013 - Present).
Committee Member, Department of Geosciences Awards Committee. (2011 - Present).

Committee Member, Department of Geosciences Executive Committee. (January 1, 2011 - Present).

Coordinator, Arts and Sciences Newsletter Coordinator (ATMO). (2009 - Present).

Faculty Advisor, Atmospheric Science Graduate Advisor. (2009 - Present).

Event Organizer, ATMO Seminar Coordinator. (2006 - Present).

Committee Chair, Search Committee - Climate Systems. (2013).

Committee Chair, Search Committee - Dynamic Meteorology. (2013).

Committee Member, Geosciences Strategic Plan Development Committee. (2011 - 2012).

Committee Chair, ATMO Search Committee. (September 1, 2011 - 2011).

Faculty Advisor, TA Coordinator. (January 1, 2009 - July 30, 2011).

Committee Member, Search Committee - Boundary Layer position. (January 1, 2011 - April 30, 2011).

Committee Chair, Search Committee - Microphysics position. (January 2011 - April 2011).

Professional Service

Member, ASCE EF-scale Radar Subcommittee. (2015 - Present).

Member, American Meteorological Society Scientific and Technological Activities Commission: Severe Local Storms. (2011 - Present).


Advisory Board Member, WxChallenge, Norman, OK. (2005 - Present).


Committee Member, American Meteorological Society. (2010 - 2011).

Committee Member, American Meteorological Society. (2010 - 2011).

Committee Member, American Meteorological Society. (2007 - 2010).

Program Organizer, American Meteorological Society, Denver, CO. (January 1, 2010 - October 15, 2010).

Public Service

Committee Member, Texas Tech Lutheran Student Fellowship. (2005 - Present).

Service Awards and Honors
Service, Professional

Special Award, American Meteorological Society. (January 2010).

GENERAL

Professional Memberships

Member of Severe Local Storms Committee, AMS Scientific and Technological Activities Commission. (2011 - Present).

Member Representative, University Corporation for Atmospheric Research. (September 2006 - Present).


Member of Radar Committee, AMS Scientific and Technological Activities Commission. (August 2007 - 2010).

Development Activities Attended

Workshop, "ORS Cayuse SP Training," Texas Tech Teaching, Learning and Professional Development Center. (September 26, 2014).


Workshop, "UCAR Annual Member's Meeting," University Corporation for Atmospheric Research, Boulder, CO, USA. (October 12, 2009 - October 14, 2009).
Professor "Mugsy" S. Yoshinobu  
Texas Tech University  
(806) 742-4025  
AARON.YOSHINOBU@TTU.EDU

Education and Post Graduate Training

Ph D, University of Southern California, 1999.  
Major: Earth Sciences  
Dissertation Title: "Magma chamber construction and deformation at oceanic spreading centers"

MS, San Diego State University, 1994.  
Major: Geological Sciences  
Dissertation Title: "Quantitative relation of structural and geochemical studies to the emplacement of shallow crustal plutons"

BS, San Diego State University, 1992.  
Major: Geological Sciences  
Dissertation Title: "Dynamothermal contact metamorphism in the aureole o

Academic and Professional Experience

Professor, Texas Tech University. (September 1, 2013 - Present).

Associate Professor, Texas Tech University. (2005 - Present).

TEACHING

Courses Taught

Texas Tech University

GEOL 1101, Physical Geology Laboratory, 27 courses.
GEOL 3102, Field Methods in Structural Geology, 2 courses.
GEOL 3302, Structural Geology, 5 courses.
GEOL 3305, Structural Analysis in Hydrocarbon Systems, 23 courses.
GEOL 3402, Structural Geology, 14 courses.
GEOL 4001, Problems in Geosciences: Topics in Fold and Thrust Belt Analysis, 5 courses.
GEOL 4300, Independent Studies in Geology: Core analysis using FMS, 5 courses.
GEOL 4312, Undergraduate Research, 11 courses.
GEOL 4334, Structural Analysis in Hydrocarbon Systems, 27 courses.
GEOL 4361, Advanced Structural Geology, 2 courses.
GEOL 4362, Tectonics, 2 courses.
GEOL 5001, Problems in Geosciences, 1 course.
GEOL 5361, Advanced Structural Geology, 4 courses.
GEOL 5362, Advanced Tectonics, 2 courses.
GEOL 6000, Master's Thesis, 18 courses.
GEOL 7000, Research, 21 courses.
GEOL 8000, Doctor's Dissertation, 8 courses.
Non-Credit Instruction

Field trip co-leader for petroleum engineering students, 80 participants. (September 2014).


Directed Student Learning

Mahmoud Mahrous, Master's Thesis Committee Chair, Geosciences. (August 2015 - Present).

Jenna Hessert, Master's Thesis Committee Chair, Geosciences. (August 2014 - Present).

Matthew Garnett, Master's Thesis Committee Chair, Geosciences. (August 2014 - Present).

Jeremy Deans, Dissertation Committee Chair, Geosciences. (2010 - Present).


Kaitlyn Andreas, Master's Thesis Committee Chair, "Studying the geometry and kinematics of gypsum-filled fractures in the Permian strata of Caprock Canyons State Park, TX, USA," Geosciences. (September 1, 2013 - August 2015).


David Manoukian, Master's Thesis Committee Chair, Geosciences. (September 2012 - May 2015).

Katie Gates, Master's Thesis Committee Chair, Geosciences. (August 2012 - May 2015).

Rachel Weiss, Master's Thesis Committee Member, Geosciences. (September 2012 - December 2014).


Jacob Leader, Master's Thesis Committee Chair, Geosciences. (2010 - 2013).

Roel Verberne, Dissertation Committee Member, Other (Outside Texas Tech University). (September 2009 - September 2013).

Andrew Whitesides, Dissertation Committee Chair, Geosciences. (2011 - June 2013).

Samantha Buck, Master's Thesis Committee Member, Geosciences. (2009 - 2012).


Wayne Marko, Dissertation Committee Member, Geosciences. (September 2004 - December 2012).


Joe Bauman, Master's Thesis Committee Chair, "Tectonism and geomorphic response in the Sacramento Mountains, South-Central New Mexico," Geosciences. (August 2009 - August 2011).

Mike Muncy, Master's Thesis Committee Chair, "Structural evolution of Pennsylvanian-Permian faults in the Sacramento Mountains, New Mexico," Geosciences. (2010).

James Green, Master's Thesis Committee Member, "Sedimentary petrography of the Ogallala Formation, Southern High Plains, Texas and New Mexico." (August 2007 - 2010).

Jeff Oalmann, Master's Thesis Committee Member, Geosciences. (August 2010).


Jeremy Deans, Master's Thesis Committee Member, Geosciences. (2009).


**RESEARCH**

**Artistic and Professional Performances and Exhibits**

**Published Intellectual Contributions**

**Abstract**


**Journal Article, Academic Journal**


Coint, N., Barnes, C. G., Yoshinobu, A., Presvik, T., Barnes, M. Reconstruction of mid-crustal pluton assembly and evolution using trace elements in augite: Sausfjellet pluton, Bindal batholith, north-central Norway..


**Journal Article, Professional Journal**

**Journal, Edited Issue**

Barnes, C. G., Coint, N., Yoshinobu, A. Crystal accumulation in a tilted arc batholith. *American Mineralogist*.

**field guide for international field conference**


**Presentations Given**


Yoshinobu, A. (Presenter & Author), Coint, N. (Author Only), Barnes, C. G. (Author Only), Chamberlain, K. (Author Only), (Author Only), Yoshinobu, A., Tore, P. (Author Only), Prodoc 4-D Adamello Conference, Bagolino, Italy, "How big is a batholithic magma chamber?", Swiss National Science Foundation, Bagolino, Italy. (September 2012).


Deans, J. (Presenter & Author), Yoshinobu, A. (Author Only), Miranda, E. (Author Only), American Geophysical Union Fall Meeting, "What is the real orientation of hypersolidus and high-temperature subsolidus foliations and lineations in the Atlantis Bank?," AGU, San Francisco. (December 2011).


Coint, N. (Presenter & Author), Barnes, C. G. (Author Only), Barnes, M. (Author Only), Yoshinobu, A. (Author Only), Fall Meeting, American Geophysical Union, "Using mineral trace element geochemistry to track magma processes in a "big tank" magma chamber: a laser ablation ICP-MS study of hornblende and augite," American Geophysical Union, San Francisco, CA. (December 2011).

Yoshinobu, A. (Presenter & Author), Swiss Geosciences Meeting, "Magma Emplacement Tectonics: What can we learn from the oceans, ophiolites and arcs? (Keynote Address)," Swiss Geosciences Foundation, Zurich, Switzerland. (November 2011).
Yoshinobu, A. (Presenter & Author), 7th Hutton Symposium on Granites, "Is there a systematic temporal variation in contact aureole rheology during magma emplacement?", University of Granada, Spain, Avila, Spain. (July 2011).


Hargrove, B. (Presenter & Author), Yoshinobu, A., American Geophysical Union Fall Meeting, "MAGMA EPLACEMENT AND FABRIC DEVELOPMENT IN THE WOOLEY CREEK BATHOLITH, KLAMATH MOUNTAINS, CA," AGU, San Francisco, CA. (December 14, 2010).

Yoshinobu, A., Geological Society of America Annual Meeting, "XENOLITH FRAGMENTATION, SCREEN FORMATION & ASSIMILATION IN THE TILTED WOOLEY CREEK BATHOLITH:
A DOG'S BREAKFAST OF PROCESSES DURING MAGMA EMBEDMENT, "Geological Society of America, Denver, CO. (November 1, 2010).


Contracts, Grants and Sponsored Research

Grant

Barnes, C. G. (Principal), Hetherington, C. (Co-Principal), Yoshinobu, A. (Co-Principal), Sylvester, P. (Co-Principal), "Subcretion versus relamination: testing processes of lower crustal modification in the Klamath Mountain accretory province," Sponsored by NSF, Texas Tech University, $350,001.00. (June 1, 2016 - May 31, 2019).


Intellectual Contributions in Submission

Journal Article, Academic Journal
Krueger, R., Yoshinobu, A. Plutons and plate motions: Middle Cretaceous Farallon-North America plate kinematics inferred from structures in the Jackass Lakes pluton-host rock system, central Sierra Nevada, CA. *Tectonophysics*.

**Research in Progress**

"Earth science and the poetry and stone masonry of Robinson Jeffers" (On-Going).

"Geologic mapping and sampling in the Marble Mountains, CA" (On-Going).
Mapping and sampling as part of NSF-funded research

"Geologic mapping in the Sacramento Mountains, central New Mexico" (On-Going).
Spring and Fall, 2009

"Kinematic studies of lower crustal and upper mantle flow at mid-ocean ridges and ophiolites" (On-Going).

"Magma emplacement tectonics" (On-Going).

"Microstructural analysis of deformed gabbros" (On-Going).

"Structural analysis of complexly deformed rocks in the Manzano Mountains, NM" (On-Going).

**Research Interests**

true, Scandinavia, Andes, Italy, Norway, Oman, North America, Indian Ocean, USA, Midwest, USA, Southwest, South America, History of Science and Technology, Energy Exploration or Reserves, Fossil Fuel Drilling and Mining, Petroleum, Geodynamics, Geology, Geomorphology, Geoscience, Marine Geology, Structural Geology, Tectonics, Volcanology, Bathymetry, Submarine Geomorphology, Mechanisms of Flow and Fracture, Geophysics, Microscopy, Planetary Studies, Philosophy of Science, Science Communication, plate tectonics, mid-ocean ridges, magma, Robinson Jeffers

**SERVICE**

**University Service**


Program Organizer, TTU Men's Soccer Team. (August 2011 - Present).

Faculty Advisor, TTU Climbing Club. (2001 - Present).

**College Service**

Committee Member, Faculty Awards Committee. (September 2014 - Present).
Department Service

Faculty Mentor, Texas Tech Men's Club Soccer Team. (August 2011 - Present).

Committee Member, Field Camp Committee. (2005 - Present).

Organizer, Departmental Seminar Series. (2000 - Present).

Committee Member, Pevehouse Faculty Search Committee. (2013 - 2014).

Faculty Mentor. (2011 - 2013).


Committee Member, Geosciences Strategic Planning Committee. (2011 - 2012).

Committee Member, Search Committee member, Assistant Professor in Sedimentology in the Geosciences Department. (2010 - 2011).


Committee Chair, Graduate Committee. (2009 - 2011).

Committee Member, Graduate Committee. (2005 - 2011).


Faculty Advisor, Advisor to Sigma Gamma Epsilon, Geoscience Honor Society. (2001 - 2009).

Professional Service

Geological Magazine, reviewer.


Journal of Petrology, reviewer.


Board Member/Foundation, Robinson Jeffers Association. (February 2006 - 2009).

Public Service

Officer, President/Elect/Past, F.C. Lubbock, Lubbock, TX.
Guest Speaker, Lubbock Independent School District, Lubbock, TX.

Board Member, Roscoe Wilson Elementary School PTA, L.I.S.D., Lubbock, TX.

Committee Member, Tech Terrace Neighborhood Association, Lubbock, TX.

Committee Member, FC Dallas-West Texas. (2013 - Present).

Member, TTU Red Raider Soccer Academy. (2012 - Present).

GENERAL

Licenses and Certifications


Professional Memberships

American Geophysical Union.

Geological Society of America.

National Association of Geoscience Teachers.

Robinson Jeffers Association.

US Soccer Federation.

Bo Zhao  
Texas Tech University  
bo.zhao@ttu.edu

Education and Post Graduate Training

Postdoctoral, University of South Dakota, 2014.  
Major: Physical Chemistry  

PhD, Virginia Commonwealth University, 2012.  
Major: Analytical Chemistry  

MS, Chinese Academy of Science, 2007.  
Major: Inorganic Chemistry/Alloy

Academic and Professional Experience

research associate, Texas Tech University. (July 1, 2014 - Present).  

researcher II, University of South Dakota. (December 3, 2012 - June 22, 2014).

TEACHING

Directed Student Learning  

Heather william, Master's Thesis Committee Member, Geosciences. (May 1, 2015 - Present).

RESEARCH

Published Intellectual Contributions

Abstract


Journal Article, Academic Journal


**Presentations Given**

Zhao, B., Collinson, M., SD EpscoR Poster session/All investigator meeting, "Hollow silica capsules with well-defined asymmetric windows in the shell," Chamberlain, SD. (June 4, 2012).

Zhao, B., Collinson, M., Pittcon Conference & Exhibition, "Template-directed fabrication of well-defined hierarchical porous gold film for electrochemical applications," Atlanta. (March 10, 2011).
Education and Post Graduate Training

Ph D, Texas Tech University, 2012.
   Major: Geophysics
   Dissertation Title: A seismologic study of the Three-Gorges Reservoir (TGR) region, China

MS, China University of Geosciences, 2007.
   Major: Geophysics

   Major: Information Optics

BA, China University of Geosciences (Wuhan), 2004.
   Major: Physics

Academic and Professional Experience

Visiting Assistant Professor, Texas Tech University. (September 1, 2013 - Present).

Research Associate, Texas Tech University. (September 1, 2012 - August 31, 2013).

TEACHING

Courses Taught

Texas Tech University
   GEOL 4324, Geology of Hydrocarbons, 2 courses.
   GPH 4321, Seismic Exploration Methods, 2 courses.
   GPH 5321, Advanced Seismic Exploration Methods, 2 courses.

Directed Student Learning

Ailiyasi Ainiwaer, Supervised Research, Physics. (September 2013 - Present).

Nicholas Talavera, Undergraduate Research, Geosciences. (September 2013 - Present).

Tave Matthew, Supervised Research, Geosciences. (September 2012 - May 2013).

Tom Harrington, Supervised Research. (September 2012 - May 2013).

RESEARCH

Published Intellectual Contributions

Abstract


**Journal Article, Academic Journal**


**Journal Article, Professional Journal**


**Presentations Given**


Zou, Z. (Presenter & Author), SEG Fall meeting, "The role of acquisition geometry and components for imaging microseismicity," Houston. (2009).

Intellectual Contributions in Submission

Journal Article, Professional Journal


GENERAL

Professional Memberships

American Geophysical Union. (September 2008 - Present).


Development Activities Attended

Workshop, "Faculty Proposal Development Program," Office of the Vice President for Research, Lubbock, TX, USA.
# APPENDIX H

## GRE revised General Test Scores

*(Information taken from http://www.ets.org/gre/institutions/scores/)*

For tests taken on or after August 1, 2011

<table>
<thead>
<tr>
<th>Section</th>
<th>Score Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Reasoning</td>
<td>130-170, in 1-point increments</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>130-170, in 1-point increments</td>
</tr>
</tbody>
</table>

For tests taken prior to August 1, 2011

<table>
<thead>
<tr>
<th>Section</th>
<th>Score Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Reasoning</td>
<td>200-800, in 10-point increments</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>200-800, in 10-point increments</td>
</tr>
</tbody>
</table>
APPENDIX I

UNIT ASSESSMENT REPORT – TRACDAT
Assessment: Account Information Four Column

Degree Program - AS - Atmospheric Science (MS)

CIP Code: 40.0401.00  
Degree Program Coordinator: Christopher Weiss  
Degree Program Coordinator Email: chris.weiss@ttu.edu  
Degree Program Coordinator Phone: 8068344712  
Program Purpose Statement: The College of Arts and Sciences offers a broad spectrum of programs and courses in the liberal arts; humanities; mathematics; and social behavioral, and natural sciences. The primary function of the college is to impart to students the knowledge skills of thinking and communicating, and values and attitudes that constitute a liberal education. The faculty of the college seeks to instill in their students a humanistic spirit, an appreciation of creativity, a commitment to excellence and truth, an ability to think critically and communicate effectively and a desire for lifelong learning.

The courses and programs in the college also provide a base of knowledge and skills form which students may enter such professional fields of study as law and medicine.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| Original Research - Upon graduation student will have conducted an original piece of significant research | Thesis - Each committee member will rate the thesis on the appropriateness of methods used  
- Professionally done: The methods used in the research are advancing the discipline  
- Well done: The methods used in the research are widely used by professionals for similar purposes  
- Acceptable: The methods used in the research are adequate for the study  
- Unacceptable: The methods used in the research are inappropriate for the study | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Inconclusive  
Results to be added in January 31, 2016 (07/02/2015) | Action for Improvement: Given our program’s recent assessment overhaul, we will add actions for improvement at the end of the next assessment cycle in 2016. (07/02/2015) |

Start Date: 08/24/2015
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Criterion:</strong> &gt;80% of students receive ratings of &quot;professionally done&quot; or &quot;well done&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Thesis - Each committee member will rate the thesis on the scientific contribution of the work</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Professionally done: The research is equal in quality to that published in leading journals</td>
<td><strong>Assessment Cycle:</strong> No Action Needed (Prior to 2015-2016)</td>
<td><strong>Action for Improvement:</strong> Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
</tr>
<tr>
<td></td>
<td>-Well done: The research is equal in quality to that published in second-tier journals</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Acceptable: The research is reasonably done, but not publishable in a journal</td>
<td><strong>Results to be added January 31, 2016 (07/02/2015)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Unacceptable: The research was poorly done</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Criterion:</strong> &gt;80% of students receive ratings of 'Professionally Done' or 'Well Done.'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Effective Communication - Upon graduation, students can communicate effectively |
|-------------------------------|---------------------------------|-------------------------------|-------------------------------|
| **Outcome Status:** Active   | **Outcome Type:** Student Learning |
| **Start Date:** 08/24/2015   | **Thesis - Each committee member will rate the thesis for writing quality.** | **Assessment Cycle:** No Action Needed (Prior to 2015-2016) | **Action for Improvement:** Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
|                              | -Professionally done: The writing of the thesis is equal to papers published in leading journals. | **Result Type:** Inconclusive |                              |
|                              | -Well done: The writing of the thesis is high quality, but not quite at professional standards | **Results to be added January 31, 2016 (07/02/2015)** |                              |
|                              | -Acceptable: The writing of the thesis meets basic standards for grammar and punctuation, organization, and readability | |                              |
|                              | -Unacceptable: The thesis is poorly written | |                              |

<p>| Criterion: &gt;80% of students receive | |</p>
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment Cycle:</strong> No Action Needed (Prior to 2015-2016)</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
<td><strong>Action for Improvement:</strong> Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
</tr>
<tr>
<td>Each committee member will rate the thesis defense for oral communication ability.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Professionally done: The oral defense of the thesis is equal to papers presented by top scientists</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Well done: The oral defense of the thesis is high quality, but not quite at professional standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Acceptable: The oral defense of the thesis meets basic standards for organization and clarity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Unacceptable: The oral defense of the thesis is unacceptable for organization and clarity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Criterion:</strong> &gt;80% of students receive ratings of 'Professionally Done' or 'Well Done.'</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Breadth of knowledge - Upon graduation, students have demonstrated a thorough fundamental knowledge of topics in Atmospheric Science</th>
<th><strong>Course Level Assessment</strong> - Instructors of a first required course will rate the comprehensive performance of students using papers, exams, and assignments.</th>
<th><strong>Assessment Cycle:</strong> No Action Needed (Prior to 2015-2016)</th>
<th><strong>Action for Improvement:</strong> Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome Status:</strong> Active</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Type:</strong> Student Learning</td>
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<tr>
<td><strong>Start Date:</strong> 08/24/2015</td>
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<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td>Actions for Improvement</td>
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<td>understanding.</td>
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<tr>
<td>-Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course.</td>
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<tr>
<td>-Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.</td>
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<tr>
<td>-Unacceptable: The student has not demonstrated an adequate understanding of the course material.</td>
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<tr>
<td><strong>Criterion:</strong> &gt;80% of students receive ratings of &quot;Holistic Understanding&quot; or &quot;Thorough Understanding&quot;</td>
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<tr>
<td><strong>Related Documents:</strong> Atmospheric Sciences MS Assessment Plan (2015)</td>
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<tr>
<td><strong>Course Level Assessment:</strong> Instructors of a second required course will rate the comprehensive performance of students using papers, exams, and assignments.</td>
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<tr>
<td>-Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding.</td>
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<tr>
<td>-Thorough understanding: The</td>
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<tr>
<td><strong>Assessment Cycle:</strong> No Action Needed (Prior to 2015-2016)</td>
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<tr>
<td><strong>Result Type:</strong> Inconclusive</td>
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<tr>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
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<tr>
<td><strong>Action for Improvement:</strong> Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
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<td>Student Learning Outcomes</td>
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</tbody>
</table>
| student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course.  
-Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.  
-Unacceptable: The student has not demonstrated an adequate understanding of the course material.  
Criterion: >80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding.' | | | |
| **MS Thesis Proposal** - All scores on scale of 1-5:  
1. (Thesis Proposal) Purpose and objectives are clearly stated in the project summary.  
2. (Thesis Proposal) Scientific problem is clearly defined and its relevance is justified.  
3. (Thesis Proposal) Methodology and work plan are well presented and feasible.  
4. (Thesis Proposal) Proposal is well organized. Illustrations and tables are neatly done.  
5. (Thesis Proposal) Budget is realistic and well justified. | **Directly related to Objective** | **Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2012-2013 MS Thesis Proposal (4 students / 5 evaluations):  
1. 4.6 2. 4.2 3. 4.2 4. 4.4 5. 4.8 (09/24/2013) | **Action for Improvement:** criteria met, but more faculty feedback on writing and scientific substance will help proposals (11/08/2013)  
**Follow-Up: Evidence of Improvement:** still more feedback is encouraged (07/03/2015)  
**Follow-Up: Evidence of Improvement:** Some improvement, but more still more feedback encouraged. (07/03/2015) |
| **Outcome Status:** Inactive  
**Outcome Type:** Student Learning  
**Start Date:** 09/01/2006 | | | |
| **Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2011-2012 MS Thesis Proposal (2 students / 2 evaluations):  
1. 4.0 2. 4.0 3. 4.0 4. 3.5 5. 5.0 (09/25/2012) | | | |
| **Assessment Cycle:** No Action Needed (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2010-2011 MS Thesis Proposal (2 students / 2 evaluations): | | | |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly related to Objective</td>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016)</td>
<td>1.3.5.2. 4.0.3. 4.0.4. 3.5.5. 4.0 (09/13/2011)</td>
<td>Action for Improvement: This cycle was the first that thesis proposals were assessed. Overall, we consider the scores favorable and will evaluate again in the next cycle. (09/10/2010)</td>
</tr>
<tr>
<td>Thesis - MS Thesis Proposal</td>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016)</td>
<td>1,4.0; 2,3.7; 3.4.0; 4.4.3; 5.4.0 (3 students) (06/12/2015)</td>
<td>Action for Improvement: No action needed (06/12/2015)</td>
</tr>
<tr>
<td>All scales on a scale of 1-5:</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
<td></td>
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</tr>
<tr>
<td>1. Students will have the skills needed to organize and perform independent M.S.-level research in Atmospheric Science.</td>
<td>Result Type: Criterion Met</td>
<td>2012-2013 MS Thesis assessment (average of 5 students / 12 evaluations): 1. 4.08 2. 4.17 3. 4.42 4. 4.05 5. 4.33 6. 4.58 7. 4.38 8. 3.75 9. 3.92 10. 3.75 (09/24/2013)</td>
<td></td>
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<tr>
<td>2. Students will have the skills needed to apply the professional standards, practices, and ethics as promulgated by the American Meteorological Society (AMS).</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
<td>9/25/2012 MS Thesis assessment (average of 2 students / 4 evaluations): 1. 4.25 2. 3.75 3. 3.54 4. 4.05 5. 3.75 6. 4.07 7. 3.75 8. 3.09 9. 3.75 10. 3.33 (09/25/2012)</td>
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<tr>
<td>3. Students will have the skills needed to read, explain, critique, and evaluate papers in the reviewed journals in atmospheric science both orally and in writing.</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
<td>9/13/2011 MS Thesis assessment (average of 3 students / 10 evaluations): 1. 4.8 2. 4.75 3. 4.7 4. 4.75 5. 4.45 6. 4.93 7. 4.75 8. 4.59 9. 4.75 10. 4.85 (09/13/2011)</td>
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<td></td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<td>Action for Improvement: Action for Improvement: Scores are strong for this academic year. No action necessary. (09/10/2011)</td>
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| | | | Action for Improvement: Noted a
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
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</thead>
</table>
| 4. Students will have all the formal qualifications to obtain entry-level professional employment in meteorology or to pursue additional graduate study.  
5. Students will have the skills expected by prospective employers to apply their understanding of atmospheric science.  
**Outcome Status:** Inactive  
**Outcome Type:** Student Learning  
**Start Date:** 09/01/2006 | Directly related to Objective  
**Result Type:** Criterion Met  
9/1/2010 2009-2010 MS Thesis assessment (average of 4 students / 9 evaluations): 1. 4.0 2. 3.67 3. 3.33 4. 3.56 5. 3.56 6. 3.89 7. 3.78 8. 3.78 9. 3.78 10. 3.5  
(09/01/2010) | small overall decrease in scores over 2008-2009, largely due to one particular poor thesis document. Will continue to monitor quality of theses generated in this program and consult with individual advisors where weaknesses are consistently identified.  
(09/01/2010)  
**Follow-Up:** Evidence of Improvement: subsequent years showed small increase in scores  
(07/15/2015)  
**Follow-Up:** Evidence of Improvement: Scores increased in subsequent years (07/15/2015) |

**Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2008-2009 MS Thesis and Oral Defense (average of 2 students / 6 evaluations):  
1. 4.67  
2. 4.67  
3. 4.33  
4. 4.33  
5. 4.67  
6. 4.67  
7. 5.00  
8. 5.00  
9. 4.67  
10. N/A  
(08/03/2009) |

**Thesis - Thesis**  
**Assessment Cycle:** No Action Needed (Prior to 2015-2016)  
**Result Type:** Criterion Met  
1, 4.1; 2, 3.7; 3, 4.0; 4, 3.8; 5, 4.0; 6, 4.1; 7, 4.6; 8, 3.9; 9, 4.0; 10, 3.2 (6 students) (06/12/2015) |

**Action for Improvement:** no action required (06/12/2015)  
**Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
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<th>Actions for Improvement</th>
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</thead>
<tbody>
<tr>
<td>MS Oral Defense - All scores on a scale of 1-5:</td>
<td>Directly related to Objective</td>
<td>2013-2014 MS Thesis assessment (average of 2 students / 6 evaluations): 1. 4.00 2. 3.67 3. 3.5 4. 4.0 5. 4.33 6. 4.0 7. 4.0 8. 3.5 9. 4.0 10. 4.0 (09/19/2014)</td>
<td>Action for Improvement: Oral defenses met criteria, but room for improvement in preparing students for defenses, especially organization and graphics (11/08/2013)</td>
</tr>
<tr>
<td>1. Presentation was well organized, smoothly delivered, and on time. 2. Visual aids were effective and of high quality. 3. Speaker demonstrated the originality and relevance of the research. 4. Speaker responded well to questions from audience and committee members.</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met 2011-2012 MS Oral Defense (average of 5 students / 12 evaluations): 1. 4.75 2. 4.25 3. 4.33 4. 4.42 (09/24/2013)</td>
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<tr>
<td>Outcome Status: Inactive Outcome Type: Student Learning Start Date: 09/01/2006</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met 9/25/2012 2011-2012 MS Oral Defense (average of 2 students / 4 evaluations): 1. 4.25 2. 3.5 3. 3.5 4. 4.0 (09/25/2012)</td>
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<tr>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016) Result Type: Criterion Met 9/13/2011 2010-2011 MS Oral Defense (average of 3 students / 10 evaluations): 1. 4.7 2. 4.7 3. 4.65 4. 4.6 (09/13/2011)</td>
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<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met 9/1/2010 2009-2010 MS Oral Defense (average of 2 students / 6 evaluations): 1. 4.67 2. 4.11 3. 3.33 4. 3.33 (09/01/2010)</td>
<td>Action for Improvement: Based on changes in numbers from 2008-2009, it appears the prepared defense presentations were improved, but the ability to effectively answer committee and public questions is somewhat weak and needs to be addressed. Closer mentoring of students presenting presentations in ATM 5101 should address this issue, if one does indeed exist. (09/01/2010) Follow-Up: Evidence of Improvement: scores improved in subsequent years. (07/15/2015)</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met</td>
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<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
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<tr>
<td>Directly related to Objective</td>
<td>Results for 2008-2009 (2 students, 6 total assessments):</td>
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<tr>
<td></td>
<td>1. 4.08</td>
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<tr>
<td></td>
<td>2. 3.92</td>
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<td>3. 4.58</td>
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<td></td>
<td>4. 4.42 (08/10/2009)</td>
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<td>Result Type: Criterion Met</td>
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<td></td>
<td>1. 4.8; 2. 4.3; 3. 4.3; 4. 3.9 (6 students) (06/12/2015)</td>
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<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<td>Result Type: Criterion Met</td>
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<td></td>
<td>2013-2014 MS Oral Defense (average of 2 students / 6 evaluations): 1. 4.0 2. 4.0 3. 4.3 4. 4.5 (09/19/2014)</td>
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<tr>
<td>Ethics Seminar Outcome - All 0-10 point scale:</td>
<td>Directly related to Objective</td>
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<tr>
<td>1. Did this seminar present information that will be useful to you in making ethical decision related to atmospheric science?</td>
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<tr>
<td>2. Did this seminar present information that was new to you?</td>
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<td>3. Did you find this seminar interesting?</td>
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<td>4. Overall, did the question and discussion add to the presentations in a helpful way?</td>
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<tr>
<td>Outcome Status: Inactive</td>
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<tr>
<td>Outcome Type: Student Learning</td>
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<td>Start Date: 09/01/2008</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<tr>
<td>Result Type: Criterion Not Met</td>
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<tr>
<td>No ethics seminar given in 2011-2012 (09/25/2012)</td>
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<tr>
<td>Action for Improvement: Failed to offer the seminar the following year. (This assessment will no longer be used after 2014/15) (07/02/2015)</td>
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<td>Follow-Up: Evidence of Improvement: this assessment removed from plan in 2015 (07/15/2015)</td>
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<tr>
<td>Follow-Up: Evidence of Improvement: course no longer will be offered. Need to take this out of assessment plan (07/15/2015)</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<tr>
<td>Result Type: Criterion Not Met</td>
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<tr>
<td>No ethics seminar given in 2010-2011. (09/13/2011)</td>
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<tr>
<td>Action for Improvement: course no longer offered. Need to remove this assessment from plan (07/15/2015)</td>
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<tr>
<td>Follow-Up: Evidence of Improvement: this assessment removed from plan in 2015 (07/15/2015)</td>
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<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<tr>
<td>Directly related to Objective</td>
<td>Result Type: Criterion Not Met</td>
<td>No ethics seminar given in 2009-2010 (09/01/2010)</td>
<td>Action for Improvement: Ethics seminar will again be administered in 2010-2011 in compliance with new NSF regulations. (09/01/2010) <strong>Follow-Up: Evidence of Improvement:</strong> course no longer offered. Need to delete this assessment from plan (07/15/2015) <strong>Follow-Up: Evidence of Improvement:</strong> this assessment removed from plan in 2015 (07/15/2015)</td>
</tr>
<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
<td>Result Type: Criterion Met</td>
<td>Ethics Seminar Results for 2008-2009:</td>
<td></td>
</tr>
<tr>
<td>Question 1 (see outcome description): Avg. 7.5/10</td>
<td></td>
<td>Question 2 Avg. 6.0/10</td>
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<tr>
<td>Question 3 Avg. 8.0/10</td>
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<td>Question 4 Avg. 8.7/10 (07/20/2009)</td>
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<tr>
<td>Performance - Ethics Seminar</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
<td>Result Type: Inconclusive</td>
<td>Action for Improvement: this assessment will no longer be used. Not enough faculty to offer separate seminar on ethics. (07/02/2015) <strong>Follow-Up: Evidence of Improvement:</strong> This assessment has been removed from the Plan (07/15/2015)</td>
</tr>
<tr>
<td></td>
<td>Result Type: Inconclusive</td>
<td>No Ethics Seminar offered this year (07/02/2015)</td>
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**Writing Assessment Outcome - All scores on 0-4 scale:**
1. Did the title and abstract accurately describe the subject and/or content of the seminar?
2. Was the presentation clear about
<table>
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<tr>
<td>defining the boundary between the student's work and the others?</td>
<td>#6: 3.46/4 Question #7: 3.26/4 Question #8: 3.52/4 Question #9: 3.26/4 (09/24/2013)</td>
<td>Directly related to Objective</td>
<td></td>
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<tr>
<td>3. Were you able to understand the content of the seminar?</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met For 2011-2012, the following are average scores for writing/seminar assessment: Question #1 (see outcome description above): 3.75/4 Question #2: 3.33/4 Question #3: 3.33/4 Question #4: 3.24/4 Question #5: 3.50/4 Question #6: 3.37/4 Question #7: 3.33/4 Question #8: 3.27/4 Question #9: 3.21/4 (09/25/2012)</td>
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<tr>
<td>4. Did the presentation lack scientific errors?</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met For 2010-2011, the following are average scores for writing/seminar assessment: Question #1 (see outcome description above): 3.75/4 Question #2: 3.36/4 Question #3: 3.44/4 Question #4: 3.32/4 Question #5: 3.58/4 Question #6: 3.55/4 Question #7: 3.41/4 Question #8: 3.35/4 Question #9: 3.21/4 (09/13/2011)</td>
<td></td>
<td>Action for Improvement: A very slight decrease was noted in most numbers from the preceding year. Nothing systematic appears to be at issue and we anticipate improvement in these numbers with higher quality graduate students in place for the 2011-2012 academic year. (09/13/2011)</td>
</tr>
<tr>
<td>5. Did the seminar hold your interest?</td>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016) Result Type: Criterion Met For 2009-2010, the following are average scores for writing/seminar assessment: Question #1 (see outcome description above): 3.81/4 Question #2: 3.57/4 Question #3: 3.51/4 Question #4: 3.36/4 Question #5: 3.63/4 Question #6: 3.65/4 Question #7: 3.49/4 Question #8: 3.34/4 Question #9: 3.24/4 (09/01/2010)</td>
<td></td>
<td>Action for Improvement: There is no obvious trend in the numbers from the previous cycle, and the numbers are largely favorable. (09/01/2010)</td>
</tr>
<tr>
<td>6. Was the seminar long enough?</td>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016) Result Type: Criterion Met For 2008-2009, the following are average scores for writing/seminar assessment: Question #1 (see outcome description above): 3.92/4 Question #2: 3.71/4 Question #3: 3.63/4 Question #4: 3.59/4 Question #5: 3.61/4 Question #6: 3.78/4</td>
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<tr>
<td>7. Did the seminar present ideas or information that was new to you?</td>
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<tr>
<td>8. Did the student answer questions appropriately and correctly?</td>
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<tr>
<td>9. Was the seminar of professional quality?</td>
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Outcome Status: Inactive Outcome Type: Student Learning Start Date: 09/01/2008
<table>
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</thead>
</table>
| **Directly related to Objective** | Question #7: 3.37/4  
Question #8: 3.58/4  
Question #9: 3.52/4 (07/20/2009) | **Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
For 2007-2008, the following are average scores for writing/seminar assessment:  
Question #1 (see outcome description above): 3.68/4  
Question #2: 3.42/4  
Question #3: 3.54/4  
Question #4: 3.47/4  
Question #5: 3.49/4  
Question #6: 3.26/4  
Question #7: 2.79/4  
Question #8: 3.18/4  
Question #9: 3.33/4 (07/20/2009) | |
|  | **Performance - Performance in Seminar** | **Assessment Cycle:** No Action Needed (Prior to 2015-2016)  
**Result Type:** Criterion Met  
1, 3.8; 2, 3.5; 3, 3.3; 4, 3.4; 5, 3.4; 6, 3.8; 7, 3.4; 8, 3.4; 9, 3.5 (140 evaluations) (06/12/2015) | **Action for Improvement:** no action needed (06/12/2015) |

**ATMO Computer Skill Outcome - A single PTA score is given if proficiency with computer programming in ATMO 5331 (Geophysical Data Field) and ATMO 5352 (Research Methods). The PTA scale is as follows (scale 1-5): 5- Student had a complete command of computer programming, including the ability to creatively and efficiently**

| Directly related to Objective | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
**Result Type:** Criterion Not Met  
Neither ATMO 5331 or ATMO 5352 were taught in the 2012-2013 academic year. (09/24/2013) | **Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
For 2011-2012, a PTA score was assigned to each student in the ATMO 5331 course (instructed by Dr. Eric Bruning), describing the student's proficiency in computer |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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</tr>
</thead>
<tbody>
<tr>
<td>develop code to solve given problems.</td>
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<tr>
<td>4- Student has demonstrates proficiency in computer programming, and can develop efficient code to handle most of the assigned tasks.</td>
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<tr>
<td>3- Student has average proficiency in computer programming. Code is occasionally inefficient (&quot;spaghetti&quot;) but does adequately perform in most cases.</td>
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<tr>
<td>2- Student struggles with computer programming, and has difficulty envisioning proper block structures. Code often contains significant errors in syntax and flow.</td>
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<tr>
<td>1- Student has no ability in computer programming, from concept to coding.</td>
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<tr>
<td>Directly related to Objective</td>
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<tr>
<td></td>
<td>programming. The average of all students assessed was 4.4/5 (09/25/2012)</td>
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<td></td>
</tr>
<tr>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016)</td>
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<td></td>
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<tr>
<td>Result Type: Criterion Met</td>
<td></td>
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<tr>
<td>Neither ATMO 5331 or ATMO 5352 were taught in the 2010-2011 academic year. ATMO 5331 will be taught again in Spring 2012. (09/13/2011)</td>
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<tr>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016)</td>
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<tr>
<td>Result Type: Criterion Met</td>
<td></td>
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<tr>
<td>Dr. Kyle Wiens instructed ATMO 5352 in Spring 2010. His PTA assessment of computer ability of seven students enrolled averaged out to 3.9/5 (09/01/2010)</td>
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<tr>
<td>Action for Improvement: No action is deemed necessary as this average score is acceptable. (09/01/2010)</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Result Type: Criterion Met</td>
<td></td>
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<tr>
<td>For 2007-2008, a PTA score was assigned to each student in the ATMO 5331 course (instructed by Dr. Chia-bo Chang), describing the student's proficiency in computer programming. The average of all students assessed was 4.0/5.</td>
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<tr>
<td>Neither target course was Instructed in 2008-2009. (07/20/2009)</td>
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<tr>
<td>Performance - PTA Score</td>
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<tr>
<td>Assessment Cycle: Action Complete (Prior to 2015-2016)</td>
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<td></td>
</tr>
<tr>
<td>Result Type: Criterion Met</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Neither ATMO 5331 or ATMO 5352 were taught in the 2013-2014 academic year. (09/19/2014)</td>
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</tr>
</tbody>
</table>
# Assessment: Account Information Four Column

## Degree Program - AS - Geography (MS)

**Degree Program Coordinator:** Gary Elbow  
**Degree Program Coordinator Email:** gary.elbow@ttu.edu  
**Degree Program Coordinator Phone:** (806) 834-0354  
**Degree Program Coordinator Mail Stop:** 1053

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| Original Research - Students will have conducted a significant piece of original research  
Outcome Status: Active  
Outcome Type: Student Learning  
Start Date: 08/24/2015 | Thesis - Each committee member will rate the thesis on the following criteria: appropriateness of methods used.  
- Professionally done: The methods used in the research are advancing the discipline  
- Well done: The methods used in the research are widely used by professionals for similar purposes  
- Acceptable: The methods used in the research are adequate for the study  
- Unacceptable: The methods used in the research are inappropriate for the study  
Criterion: >80% of students receive ratings of 'Professionally Done' or 'Well Done.'  
Result Type: Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>will rate the thesis on the following criteria: scientific contribution of the work.</td>
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<tr>
<td></td>
<td>Professionally done: The research is equal in quality to that published in leading journals</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Well done: The research is equal in quality to that published in second-tier journals</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Acceptable: The research is reasonably done, but not publishable in a journal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unacceptable: The research was poorly done</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Result Type: Inconclusive</td>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Effective Communication - Students can communicate effectively</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Status: Active</td>
</tr>
<tr>
<td>Outcome Type: Student Learning</td>
</tr>
<tr>
<td>Start Date: 08/24/2015</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thesis - Each committee member will rate the thesis for writing quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professionally done: The writing of the thesis is equal to papers published in leading journals.</td>
</tr>
<tr>
<td>Well done: The writing of the thesis is high quality, but not quite at professional standards</td>
</tr>
<tr>
<td>Acceptable: The writing of the thesis meets basic standards for grammar and punctuation, organization, and readability</td>
</tr>
<tr>
<td>Unacceptable: The thesis is poorly written</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Cycle: No Action Needed (Prior to 2015-2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result Type: Inconclusive</td>
</tr>
<tr>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
</tr>
<tr>
<td>Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
</tr>
</tbody>
</table>

<p>| Criterion: &gt;80% of students receive ratings of 'Professionally Done' or 'Well Done.' |</p>
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| **Assessment Methods**   | ratings of ‘Professionally Done’ or ‘Well Done.’ | **Assessment Cycle:** No Action Needed (Prior to 2015-2016)  
**Result Type:** Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | **Action for Improvement:** Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
| **Related Documents:** | **GEOG_MS_Assessment_Plan (2015)** | | |
| **Thesis** - Each committee member will rate the thesis defense for oral communication ability. | | | |
| -Professionally done: The oral defense of the thesis is equal to papers presented by top scientists  
-Well done: The oral defense of the thesis is high quality, but not quite at professional standards  
-Acceptable: The oral defense of the thesis meets basic standards for organization and clarity  
-Unacceptable: The oral defense of the thesis is unacceptable for organization and clarity | | | |
| **Criterion:** >80% of students receive ratings of ‘Professionally Done’ or ‘Well Done.’ | | | |
| | | | |
| **Breadth of knowledge** - Students have demonstrated a thorough fundamental knowledge of topics in Geography | **Course Level Assessment** - Instructors of a first required course will rate the comprehensive performance of students using papers, exams, and assignments. | **Assessment Cycle:** No Action Needed (Prior to 2015-2016)  
**Result Type:** Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | **Action for Improvement:** Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
| **Outcome Status:** Active  
**Outcome Type:** Student Learning  
**Start Date:** 08/24/2015 | -Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden | | |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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<tbody>
<tr>
<td></td>
<td>understanding.</td>
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<tr>
<td></td>
<td>-Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course.</td>
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<td></td>
<td>-Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.</td>
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<td></td>
<td>-Unacceptable: The student has not demonstrated an adequate understanding of the course material.</td>
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</tr>
<tr>
<td><strong>Criterion:</strong></td>
<td>&gt;80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding'</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Related Documents:</strong></td>
<td>GEOG_MS_Assessment_Plan (2015)</td>
<td></td>
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</tr>
<tr>
<td><strong>Course Level Assessment</strong></td>
<td>Instructors of a second required course will rate the comprehensive performance of students using papers, exams, and assignments.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>-Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding.</td>
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</tr>
<tr>
<td><strong>Assessment Cycle:</strong></td>
<td>No Action Needed (Prior to 2015-2016)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Result Type:</strong></td>
<td>Inconclusive</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Results:</strong></td>
<td>Results to be added January 31, 2016 (07/02/2015)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Action for Improvement:</strong></td>
<td>Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
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<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td>Actions for Improvement</td>
</tr>
<tr>
<td>---------------------------</td>
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<tr>
<td>- Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course.</td>
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<tr>
<td>- Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.</td>
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<tr>
<td>- Unacceptable: The student has not demonstrated an adequate understanding of the course material.</td>
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<tr>
<td>Criterion: &gt;80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding.'</td>
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</tbody>
</table>

**MS Thesis Proposal: Project Summary**
- **Project Type:** Thesis
- **Purpose:** Project summary
- **Outcome Status:** Inactive
- **Outcome Type:** Student Learning
- **Start Date:** 09/01/2013
- **End Date:** 08/31/2014

**Assessment Cycle:** Action To Be Defined (Prior to 2015-2016)
**Result Type:** Inconclusive
**Assessment Date:** no proposals evaluated in 2014/15 (06/12/2015)

**Assessment Cycle:** Action Complete (Prior to 2015-2016)
**Result Type:** Criterion Met
**Assessment Date:** 2.65 (11/08/2013)

**Action for Improvement:** Faculty encouraged to work more closely with students on thesis writing. (07/03/2015)
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MS Thesis Defense, Oral</strong>&lt;br&gt;Presentation: Technical Aspects - Delivery: Oral Defense Technical Aspects - Delivery&lt;br&gt;Outcome Status: Inactive&lt;br&gt;Outcome Type: Student Learning&lt;br&gt;Start Date: 09/01/2013&lt;br&gt;End Date: 08/31/2014</td>
<td>Thesis - 3 - Speaker adequately assesses and addresses the audience&lt;br&gt;2 - Speaker addresses audience, but delivery is not smooth&lt;br&gt;1 - Speaker does not address the audience rather their visual aids; delivery is not smooth&lt;br&gt;0 - Speaker cannot be heard; delivery is poor&lt;br&gt;Criterion: Score 3, 2, 1, or 0 points given as defined by the Assessment Method.</td>
<td><strong>Assessment Cycle:</strong> Action To Be Defined (Prior to 2015-2016)&lt;br&gt;<strong>Result Type:</strong> Inconclusive&lt;br&gt;No thesis defenses in 2014/15 (06/12/2015)</td>
<td><strong>Action for Improvement:</strong> Thesis advisors encouraged to work more closely with students on preparing and delivering talks. (07/03/2015)</td>
</tr>
<tr>
<td><strong>MS Thesis: Scientific Context - Abstract and Introductory Chapters</strong>&lt;br&gt;- Thesis Scientific Context - Abstract and Introductory Chapters&lt;br&gt;Outcome Status: Inactive&lt;br&gt;Outcome Type: Student Learning&lt;br&gt;Start Date: 09/01/2013&lt;br&gt;End Date: 08/24/2015</td>
<td>Thesis - 3 - Purpose and objectives clearly stated; intellectual merit clearly stated; broader impacts of research clearly stated; scientific problem is clearly addressed; context and relevance is clearly addressed.&lt;br&gt;2 - Purpose and objectives stated, but muddled; intellectual merit stated, but unclear; broader impacts of research stated, but unclear; scientific problem is addressed; context and relevance are addressed.&lt;br&gt;1 - Purpose and objectives stated, but inaccurate; intellectual merit</td>
<td><strong>Assessment Cycle:</strong> Action To Be Defined (Prior to 2015-2016)&lt;br&gt;<strong>Result Type:</strong> Inconclusive&lt;br&gt;No theses completed in 2014/15 (06/12/2015)</td>
<td><strong>Action for Improvement:</strong> need theses to be defended in order to assess this (06/12/2015)</td>
</tr>
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**01/15/2016**

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<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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</thead>
</table>
| MS Thesis: Scientific Context - Discussion of Methods Used - Thesis | Insufficiently addressed; broader impacts insufficiently addressed; problem is incompletely addressed; context and relevance are not sufficiently developed. 0 - Purpose and objectives not stated; intellectual merit not addressed; broader impacts not addressed; problem is insufficiently introduced; relevance and context are not provided. Criterion: Score 3,2,1, or 0 points given as defined by the Assessment Method. | Assessment Cycle: Action To Be Defined (Prior to 2015 - 2016)  
Result Type: Inconclusive  
No theses defended in 2014/15 (06/12/2015) | Action for Improvement: need theses to be defended in order to assess this (06/12/2015) |
| MS Thesis: Scientific Content - Discussion of Data (including acquisition and quality of analysis) - Thesis | Thesis - 3 - Methods of data acquisition are well-described and robust. 1 - Methods of data acquisition are described, but unclear. 0 - Methods of data acquisition are vague. Criterion: Score 3,2,1, or 0 points given as defined by the Assessment Method. | Assessment Cycle: Action Complete (Prior to 2015-2016)  
Result Type: Criterion Met  
2.75 (09/18/2014) | Action for Improvement: more emphasis on detailed methodology in proposal and insistence on properly following protocol in doing the research (11/08/2013) |
| MS Thesis: Scientific Context - Discussion of Methods Used | | Assessment Cycle: Action To Be Defined (Prior to 2015-2016)  
Result Type: Inconclusive  
no theses defended in 2014/15 (06/12/2015) | Action for Improvement: need theses to be defended in order to assess this (06/12/2015) |
| MS Thesis: Scientific Content - Discussion of Data (including acquisition and quality of analysis) | | Assessment Cycle: Action Complete (Prior to 2015-2016)  
Result Type: Criterion Met  
2.75 (09/18/2014) | |

01/15/2016
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<tr>
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<tr>
<td></td>
<td>2 - Extensive analyses, minimal discussion of errors; detailed data reduction, but minimal interpretation; discussion of data and interpretation poorly supported and referenced main points and results are adequately summarized/concluded and reinforced; research techniques are routine, but the results are novel and necessary, and have broad impact on the discipline and in general.</td>
<td>Assessment Cycle: Action In Progress (Prior to 2015-2016) Result Type: Criterion Met 2.5 (11/08/2013)</td>
<td>Action for Improvement: more careful insistence on rigor in data analysis and interpretation (11/08/2013)</td>
</tr>
<tr>
<td></td>
<td>1 - Adequate analyses, no discussion of associated errors; adequate data reduction, but no data interpretation; summary/conclusions presented, but main points are not reinforced; research is routine, but results and/or interpretations are novel and advance the discipline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 - Inadequate analyses, no discussion of associated errors; poor data reduction, no interpretation; summary and conclusions just a rewrite of the discussion; research and interpretation of results are routine.</td>
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<tr>
<td></td>
<td>Criterion: Score 3, 2, 1, or 0 points given as defined by the Assessment Method.</td>
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</tbody>
</table>

**MS Thesis: Technical Aspects**
- **Organization:** Thesis Organization
- **Outcome Status:** Inactive
- **Outcome Type:** Student Learning
- **Start Date:** 09/01/2013
- **End Date:** 08/24/2015

**Thesis - 3 - Follows a smooth, logical progression from problem statement, methodology to results and conclusions**
- Assessment Cycle: Action To Be Defined (Prior to 2015-2016)
- Result Type: Inconclusive
- no theses defended in 2014/15 (06/12/2015)

**Assessment Cycle:** Action Complete (Prior to 2015-2016)

**Action for Improvement:** need theses to be defended in order to assess this (06/12/2015)
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
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</thead>
<tbody>
<tr>
<td><strong>Assessment Methods</strong></td>
<td><strong>Results</strong></td>
<td><strong>Actions for Improvement</strong></td>
<td></td>
</tr>
<tr>
<td>Statement, methodology to results and conclusions</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Assessment Cycle:</strong> Action Complete (Prior to 2015-2016)</td>
<td></td>
</tr>
<tr>
<td>1 - Does not follow a smooth and logical progression from problem statement to methodology to results, but conclusions are coherent</td>
<td>2.75 (09/18/2014)</td>
<td></td>
<td><strong>Result Type:</strong> Criterion Met</td>
</tr>
<tr>
<td>0 - Does not follow a smooth and logical progression from problem statement, to methodology to results, and a conclusion is lacking</td>
<td><strong>Assessment Cycle:</strong> Action Complete (Prior to 2015-2016)</td>
<td></td>
<td>2.85 (11/08/2013)</td>
</tr>
<tr>
<td><strong>Criterion:</strong> Score 3, 2, 1, or 0 points given as defined by the Assessment Method.</td>
<td></td>
<td><strong>Action for Improvement:</strong> need theses to be defended in order to assess this (06/12/2015)</td>
<td></td>
</tr>
<tr>
<td><strong>MS Thesis: Technical Aspects - Referencing/Illustrations/Tables - Thesis</strong></td>
<td><strong>Thesis - 3:</strong> Previous research is adequately characterized and referenced; illustrations and or tables are appropriate, neatly constructed</td>
<td><strong>Assessment Cycle:</strong> Action To Be Defined (Prior to 2015-2016)</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Status:</strong> Inactive</td>
<td>2 - Previous research is poorly characterized and is not cited; illustrations and/or tables are appropriate, but not clearly conceived</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Type:</strong> Student Learning</td>
<td>1 - Previous research is not cited; illustrations and/or tables are inappropriate and/or are messy</td>
<td>no theses defended in 2014/15 (06/12/2015)</td>
<td></td>
</tr>
<tr>
<td><strong>Start Date:</strong> 09/01/2013</td>
<td>0 - Previous research is not cited; illustrations and/or tables are not included, but are needed</td>
<td><strong>Assessment Cycle:</strong> Action Complete (Prior to 2015-2016)</td>
<td><strong>Result Type:</strong> Criterion Met</td>
</tr>
<tr>
<td><strong>End Date:</strong> 08/24/2015</td>
<td><strong>Criterion:</strong> Score 3, 2, 1, or 0 points given as defined by the Assessment Method.</td>
<td>2.75 (09/18/2014)</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment Cycle:</strong> Action Complete (Prior to 2015-2016)</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td>2.85 (11/08/2013)</td>
<td><strong>Action for Improvement:</strong> need theses to be defended in order to assess this (06/12/2015)</td>
</tr>
<tr>
<td><strong>MS Thesis: Technical Aspects - Writing - Thesis Writing</strong></td>
<td><strong>Thesis - 3:</strong> Correct grammar and concise, articulate presentation</td>
<td><strong>Assessment Cycle:</strong> Action To Be Defined (Prior to 2015-2016)</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Status:</strong> Inactive</td>
<td>2 - Poor grammar, but presentation is concise and articulate</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Type:</strong> Student Learning</td>
<td>1 - Grammar is appropriate, but presentation is inarticulate</td>
<td>no theses defended in 2014/15 (06/12/2015)</td>
<td></td>
</tr>
<tr>
<td><strong>Start Date:</strong> 09/01/2013</td>
<td><strong>Assessment Cycle:</strong> Action Complete (Prior to 2015-2016)</td>
<td>2.75 (09/18/2014)</td>
<td><strong>Action for Improvement:</strong> need theses to be defended in order to assess this (06/12/2015)</td>
</tr>
<tr>
<td><strong>End Date:</strong> 08/24/2015</td>
<td><strong>Action for Improvement:</strong> Thesis</td>
<td>2.85 (11/08/2013)</td>
<td></td>
</tr>
</tbody>
</table>

01/15/2016

Generated by TracDat® a product of Nuventive
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Poor grammar and inarticulate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Criterion: Score 3, 2, 1, or 0 points given as defined by the Assessment Method. |  
Result Type: Criterion Met  
2.75 (09/18/2014) |  
Advisors encouraged to work more closely with students on writing (07/02/2015)  
Follow-Up: Evidence of Improvement: Improvements marginal at best. More emphasis by faculty needed. (07/03/2015) |

**Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2.75 (09/18/2014)

**Assessment Cycle:** Action In Progress (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2.65 (11/08/2013)  
**Action for Improvement:** More rigor by advisors in editing theses (11/08/2013)

**Assessment Cycle:** Action To Be Defined (Prior to 2015-2016)  
**Result Type:** Inconclusive  
No theses defended in 2014/15 (06/12/2015)  
**Action for Improvement:** Need theses to be defended in order to assess this (06/12/2015)

**Assessment Cycle:** Action Complete (Prior to 2015-2016)  
**Result Type:** Criterion Met  
2.9 (11/08/2013)  
**Action for Improvement:** Need theses to be defended in order to assess this (06/12/2015)
Assessment: Account Information Four Column

Degree Program - AS - Geosciences (MS)

CIP Code: 40.0601.00
Degree Program Coordinator: Callum Hetherington
Degree Program Coordinator Email: callum.hetherington@ttu.edu
Degree Program Coordinator Phone: 18068343110

<table>
<thead>
<tr>
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<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Research - Students will have conducted a significant piece of original research</td>
<td><strong>Thesis</strong> - Each committee member will rate the thesis on the appropriateness of methods used&lt;br&gt;- Professionally done: The methods used in the research are advancing the discipline&lt;br&gt;- Well done: The methods used in the research are widely used by professionals for similar purposes&lt;br&gt;- Acceptable: The methods used in the research are adequate for the study&lt;br&gt;- Unacceptable: The methods used in the research are inappropriate for the study</td>
<td><strong>Assessment Cycle:</strong> No Action Needed (Prior to 2015-2016)&lt;br&gt;<strong>Result Type:</strong> Inconclusive&lt;br&gt;Results to be added January 31, 2016 (07/02/2015)</td>
<td><strong>Action for Improvement:</strong> Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
</tr>
<tr>
<td>Outcome Status: Active</td>
<td><strong>Thesis</strong> - Each committee member will rate the thesis on the scientific contribution of the work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome Type: Student Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start Date: 08/24/2015</td>
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</table>

01/15/2016

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<tbody>
<tr>
<td></td>
<td>-Professionally done: The research is equal in quality to that published in leading journals &lt;br&gt;-Well done: The research is equal in quality to that published in second-tier journals &lt;br&gt;-Acceptable: The research is reasonably done, but not publishable in a journal &lt;br&gt;-Unacceptable: The research was poorly done</td>
<td>fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Criterion: &gt;80% of students receive ratings of 'Professionally Done' or 'Well Done.'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective Communication - Students can communicate effectively.</td>
<td>Thesis - Each committee member will rate the thesis for writing quality.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome Status: Active</td>
<td>-Professionally done: The writing of the thesis is equal to papers published in leading journals. &lt;br&gt;-Well done: The writing of the thesis is high quality, but not quite at professional standards &lt;br&gt;-Acceptable: The writing of the thesis meets basic standards for grammar and punctuation, organization, and readability &lt;br&gt;-Unacceptable: The thesis is poorly written</td>
<td>Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
<td></td>
</tr>
<tr>
<td>Outcome Type: Student Learning</td>
<td>Criterion: &gt;80% of students receive ratings of 'Professionally Done' or 'Well Done.'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start Date: 08/24/2015</td>
<td>Related Documents: Geosciences MS Assessment Plan (2015) Thesis - Each committee member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td>Actions for Improvement</td>
</tr>
<tr>
<td>---------------------------</td>
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<td>-------------------------</td>
</tr>
<tr>
<td>will rate the thesis defense for oral communication ability. -Professionally done: The oral defense of the thesis is equal to papers presented by top scientists -Well done: The oral defense of the thesis is high quality, but not quite at professional standards -Acceptable: The oral defense of the thesis meets basic standards for organization and clarity -Unacceptable: The oral defense of the thesis is unacceptable for organization and clarity</td>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016) Result Type: Inconclusive Results to be added January 31, 2016 (07/02/2015).</td>
<td>Action for Improvement: Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015).</td>
<td></td>
</tr>
</tbody>
</table>

**Breadth of knowledge - Upon graduation, students have demonstrated a thorough fundamental knowledge of topics in Geosciences**

**Outcome Status:** Active

**Outcome Type:** Student Learning

**Start Date:** 08/24/2015

**Course Level Assessment** - Instructors of a first required course will rate the comprehensive performance of students using papers, exams, and assignments:

- Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding.

- Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the...
## Student Learning Outcomes

### Assessment Methods
- Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.
- Unacceptable: The student has not demonstrated an adequate understanding of the course material.

### Criterion
> 80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding.'

### Related Documents
- Geosciences MS Assessment Plan (2015)

### Course Level Assessment
- Instructors of a second required course will rate the comprehensive performance of students using papers, exams, and assignments:

  **Holistic understanding:** The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding.

  **Thorough understanding:** The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course.

### Assessment Cycle
- No Action Needed (Prior to 2015-2016)
- Result Type: Inconclusive
- Results to be added January 31, 2016 (07/02/2015)

### Action for Improvement
- Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)
### Student Learning Outcomes

<table>
<thead>
<tr>
<th>Assessment Methods</th>
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<th>Actions for Improvement</th>
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</thead>
<tbody>
<tr>
<td>- Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Unacceptable: The student has not demonstrated an adequate understanding of the course material.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Criterion:</strong> :80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding.'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Knowledge and Familiarity
- Students will acquire advanced knowledge and demonstrate familiarity with current research conducted in their chosen geoscience discipline.

**Outcome Status:** Inactive

**Outcome Type:** Student Learning

**Start Date:** 07/01/2006

### Course Level Assessment
- Assessment of the Master of Science Program in Geosciences relies heavily on Primary Trait Analysis (PTA) of student research and presentation of results. PTA of the formal thesis proposal will provide an early assessment.

**Criterion:** Average score above 2.4.

### Thesis Proposal - MS Thesis Proposal

**Outcome Status:** Inactive

**Outcome Type:** Student Learning

**Start Date:** 09/01/2006

**Thesis - Rubric - Purpose and objectives are clearly stated in the project summary.**

**Criterion:** Average score above 2.4

**Schedule:** At Proposal

**Assessment Cycle:** Action in Progress (Prior to 2015-2016)

**Result Type:** Criterion Met

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006 - 2007</td>
<td>2.5</td>
</tr>
<tr>
<td>2007 - 2008</td>
<td>2.6</td>
</tr>
<tr>
<td>2008 - 2009</td>
<td>2.1</td>
</tr>
<tr>
<td>2009 - 2010</td>
<td>2.4</td>
</tr>
<tr>
<td>2010 - 2011</td>
<td>2.9</td>
</tr>
<tr>
<td>2011 - 2012</td>
<td>2.2</td>
</tr>
<tr>
<td>2012 - 2013</td>
<td>2.5</td>
</tr>
<tr>
<td>2013 - 2014</td>
<td>2.5</td>
</tr>
<tr>
<td>2014 - 2015</td>
<td>2.3</td>
</tr>
<tr>
<td>06/11/2015</td>
<td></td>
</tr>
</tbody>
</table>

**Action for Improvement:** Thesis advisors encouraged to work more closely with students on thesis introduction (07/02/2015)

**Action for Improvement:** Data holding steady; continue to monitor. (06/11/2015)

**Action for Improvement:** Data holding steady, continue to monitor. (09/18/2014)

**Action for Improvement:** Continue monitoring (08/27/2013)

**Action for Improvement:** Scores
### Student Learning Outcomes

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| Thesis - Rubric - Methodology and work plan are well presented and feasible. | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Inconclusive  
(2006 - 2007) 2.5  
(2007 - 2008) 2.4  
(2008 - 2009) 2.1  
(2009 - 2010) 2.8  
(2010 - 2011) 2.1  
(2011 - 2012) 1.8  
(2012 - 2013) 2.4  
(2013 - 2014) 2.6  
(2014 - 2015) 2.3 (06/11/2015) |  
Action for Improvement: Scores are improving in recent years. No action necessary.  
(09/25/2011) |  
Action for Improvement: Year-on-year variability. Continue to monitor.  
(06/11/2015) |
| Thesis - Rubric - Proposal is well organized. Illustrations and tables are neatly done. | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Criterion Met  
(2006 - 2007) 2.5  
(2007 - 2008) 2.4  
(2008 - 2009) 2.6  
(2009 - 2010) 2.7  
(2010 - 2011) 2.5  
(2011 - 2012) 2.4  
(2012 - 2013) 2.7  
(2013 - 2014) 2.5 |  
Action for Improvement: Data holding steady; continue to monitor.  
(06/11/2015) |  
Action for Improvement: Continue collecting data  
(09/18/2014) |  
Action for Improvement: Continue gathering data  
(08/27/2013) |  
Action for Improvement:  
(11/05/2010) |
<table>
<thead>
<tr>
<th><strong>Student Learning Outcomes</strong></th>
<th><strong>Assessment Methods</strong></th>
<th><strong>Results</strong></th>
<th><strong>Actions for Improvement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Action for Improvement: Continue gathering data (09/25/2011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Action for Improvement: continue gathering data (11/05/2010)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Thesis - Rubric - Budget is realistic and well justified.**
**Criterion:** Average score above 2.4
**Schedule:** At Proposal

**Assessment Cycle:** No Action Needed (Prior to 2015-2016)
**Result Type:** Criterion Met

<table>
<thead>
<tr>
<th>(2006 - 2007) 2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2007 - 2008) 2.0</td>
</tr>
<tr>
<td>(2008 - 2009) 2.6</td>
</tr>
<tr>
<td>(2009 - 2010) 2.7</td>
</tr>
<tr>
<td>(2010 - 2011) 2.9</td>
</tr>
<tr>
<td>(2011 - 2012) 2.6</td>
</tr>
<tr>
<td>(2012 - 2013) 1.0</td>
</tr>
<tr>
<td>(2013 - 2014) 2.1</td>
</tr>
</tbody>
</table>

**Action for Improvement:** Improvements observed attributed to change in Graduate Seminar curriculum. (06/11/2015)
**Action for Improvement:** Provide guidelines on designing a budget in Graduate Seminar. (09/18/2014)
**Action for Improvement:** Method may need to be revised so that it distinguishes between externally funded and self-funded research projects (08/27/2013)
**Action for Improvement:** Continue gathering data (08/30/2012)
**Action for Improvement:** Scores are improving in recent years. No action necessary. (09/25/2011)
**Action for Improvement:** Budget is realistic and well justified. (08/25/2010)

**Thesis - Rubric - Purpose and objectives are clearly stated in the abstract and the introduction.**
**Criterion:** Average score above 2.4

**Assessment Cycle:** Action In Progress (Prior to 2015-2016)
**Result Type:** Criterion Met

<table>
<thead>
<tr>
<th>(2006 - 2007) 2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2007 - 2008) 1.9</td>
</tr>
<tr>
<td>(2009 - 2010) 2.1</td>
</tr>
<tr>
<td>(2010 - 2011) 2.5</td>
</tr>
<tr>
<td>(2011 - 2012) 2.0</td>
</tr>
</tbody>
</table>

**Action for Improvement:** Continued improvement observed, showing better preparation of students as they tackle research proposal development. (06/11/2015)
**Action for Improvement:** General
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| Thesis - Rubric - Methodology is appropriate and well described. | Assessment Cycle: Action Complete (Prior to 2015-2016) | (2012 - 2013) 2.0  
(2013 - 2014) 2.3  
(2014 - 2015) 2.5 (06/11/2015) | positive trend; continue collecting data. (09/18/2014) |
| Criterion: Average score above 2.4 | Result Type: Inconclusive | (2006 - 2007) 2.3  
(2007 - 2008) 1.8  
(2009 - 2010) 2.7  
(2010 - 2011) 2.5  
(2011 - 2012) 2.2  
(2012 - 2013) 2.6  
(2013 - 2014) 2.4  

| Thesis - Rubric - Data gathered are of high quality and analysis is sound. | Assessment Cycle: Action Complete (Prior to 2015-2016) | (2012 - 2013) 2.0  
(2013 - 2014) 2.3  
(2014 - 2015) 2.5 (06/11/2015) | Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012) |
| Criterion: Average score above 2.4 | Result Type: Criterion Met | (2006 - 2007) 1.8  
(2007 - 2008) 1.9  
(2009 - 2010) 2.4  
(2010 - 2011) 2.5 | Action for Improvement: Action for Improvement: Continue collecting data (09/25/2011) |
<table>
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<td></td>
<td>(2011 - 2012) 1.9</td>
<td></td>
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<tr>
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<td></td>
<td>(2013 - 2014) 2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2014 - 2015) 2.6</td>
<td>(06/11/2015)</td>
<td></td>
</tr>
</tbody>
</table>

**Action for Improvement:** After two poorer years, data has rebounded. Continue monitoring and strive to maintain consistency. (09/18/2014)

**Follow-Up: Evidence of Improvement:** Scores look good. Continue what we are doing. (07/03/2015)

**Action for Improvement:** Continue gathering data (08/27/2013)

**Action for Improvement:** Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)

**Action for Improvement:** Scores are improving in recent years. No action necessary. (09/25/2011)

---

<table>
<thead>
<tr>
<th>Thesis - Rubric - Key findings of the work are well presented in the conclusion.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion:</strong> Average score above 2.4</td>
</tr>
</tbody>
</table>

**Assessment Cycle:** Action In Progress (Prior to 2015-2016)

**Result Type:** Criterion Met

(2006 - 2007) 2.1
(2007 - 2008) 1.8
(2009 - 2010) 2.2
(2010 - 2011) 2.5
(2011 - 2012) 2.1
(2012 - 2013) 1.8
(2013 - 2014) 2.1
(2013 - 2014) 2.5 (06/11/2015)

**Action for Improvement:** Improvement shown; may be related to observed improvements in quality of data, and understanding of data. Continue to monitor. (06/11/2015)

**Action for Improvement:** Data fluctuates with no significant improvement. Consider how to improve student presentation of main conclusions. (09/18/2014)

**Action for Improvement:** Continue gathering data (08/27/2013)

**Action for Improvement:** Scores fluctuate year to year. Closer
<table>
<thead>
<tr>
<th>Thesis - Rubric - Research is novel and has broad impacts.</th>
<th>Assessment Cycle: Action In Progress (Prior to 2015-2016)</th>
<th>Result Type: Criterion Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion: Average score above 2.4</td>
<td>Assessment Cycle: Action In Progress (Prior to 2015-2016)</td>
<td>Result Type: Criterion Met</td>
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<tr>
<td></td>
<td>(2006 - 2007) 1.5</td>
<td>(2006 - 2007) 2.4</td>
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<td></td>
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<td>(2009 - 2010) 2.0</td>
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<td>(2010 - 2011) 2.5</td>
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<td>(2011 - 2012) 2.3</td>
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<td></td>
<td>(2012 - 2013) 1.7</td>
<td>(2012 - 2013) 2.1</td>
</tr>
<tr>
<td></td>
<td>(2013 - 2014) 1.8</td>
<td>(2013 - 2014) 2.6</td>
</tr>
</tbody>
</table>

Action for Improvement: Improvements observed. Attributed to improved quality of student recruitment and research topics developed by Faculty. (06/11/2015)

Action for Improvement: Continue collecting data. (09/18/2014)

Action for Improvement: Continue gathering data. (08/27/2013)

Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)

Action for Improvement: Scores are improving in recent years. No action necessary. (09/25/2011)

---

<table>
<thead>
<tr>
<th>Thesis - Rubric - Thesis is well organized.</th>
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</tr>
</thead>
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<td>(2010 - 2011) 2.5</td>
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</tr>
<tr>
<td></td>
<td>(2013 - 2014) 2.6</td>
<td>(2013 - 2014) 2.6</td>
</tr>
</tbody>
</table>

Action for Improvement: Performance holds steady; continue to monitor. (05/11/2015)

Action for Improvement: Improvement shown; continue collecting data. (09/18/2014)

Action for Improvement: Continue gathering data. (08/27/2013)

Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)
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<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Consistency from year-to-year. Continue collecting data. (09/18/2014)</td>
</tr>
<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
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</tr>
<tr>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
</tr>
<tr>
<td>(2010 - 2011) 2.5</td>
<td>(2010 - 2011) 2.5</td>
<td>(2010 - 2011) 2.5</td>
<td>(2010 - 2011) 2.5</td>
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<tr>
<td>(2012 - 2013) 2.0</td>
<td>(2012 - 2013) 2.0</td>
<td>(2012 - 2013) 2.0</td>
<td>(2012 - 2013) 2.0</td>
</tr>
</tbody>
</table>

Action for Improvement: Scores remain high reflecting recruitment of better prepared students to program. (06/11/2015)

Action for Improvement: Continue collecting data (09/18/2014)

Action for Improvement: Continue gathering data (08/27/2013)

Action for Improvement: Continue gathering data (08/30/2012)

Action for Improvement: Scores are improving in recent years. No action necessary. (09/25/2011)

---

<table>
<thead>
<tr>
<th>Thesis - Rubric - Work has been (is being) published or presented in a reputable venue.</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)</td>
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</tr>
<tr>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
<td><strong>Result Type:</strong> Criterion Met</td>
</tr>
<tr>
<td>(2009 - 2010) 2.3</td>
<td>(2009 - 2010) 2.3</td>
<td>(2009 - 2010) 2.3</td>
<td>(2009 - 2010) 2.3</td>
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<tr>
<td>(2010 - 2011) 1.5</td>
<td>(2010 - 2011) 1.5</td>
<td>(2010 - 2011) 1.5</td>
<td>(2010 - 2011) 1.5</td>
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<tr>
<td>(2011 - 2012) 1.0</td>
<td>(2011 - 2012) 1.0</td>
<td>(2011 - 2012) 1.0</td>
<td>(2011 - 2012) 1.0</td>
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<tr>
<td>(2012 - 2013) 1.3</td>
<td>(2012 - 2013) 1.3</td>
<td>(2012 - 2013) 1.3</td>
<td>(2012 - 2013) 1.3</td>
</tr>
</tbody>
</table>

Action for Improvement: Reflects challenges for MS students to publish results of thesis. Consider changing style of thesis to manuscript oriented product. (06/11/2015)

Action for Improvement: Consider strategies for increasing student authorship. (09/18/2014)

Action for Improvement: Continue gathering data (08/27/2013)

Action for Improvement: Scores fluctuate year to year. Closer
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------</td>
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<td></td>
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<td>(2006 - 2007) 2.3</td>
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<td>(2007 - 2008) 2.0</td>
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<td>(2008 - 2009) 2.5</td>
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<td>(2009 - 2010) 2.3</td>
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<td>(2010 - 2011) 2.4</td>
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<td>(2011 - 2012) 1.9</td>
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<td>(2012 - 2013) 2.0</td>
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<tr>
<td></td>
<td></td>
<td>(2013 - 2014) 2.6</td>
<td></td>
</tr>
<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td></td>
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<td>--------------------------</td>
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</tbody>
</table>

**Actions for Improvement:**
Fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)

**Action for Improvement:**
Continue gathering data for assessing longer-term trends (09/25/2011)
# Assessment: Account Information Four Column

## Degree Program - AS - Geosciences (PHD)

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| Original Research - Students will have conducted a significant piece of original research | Dissertation - Each committee member will rate the thesis on the following criteria: appropriateness of methods used.  
- Professionally done: The methods used in the research are advancing the discipline  
- Well done: The methods used in the research are widely used by professionals for similar purposes  
- Acceptable: The methods used in the research are adequate for the study  
- Unacceptable: The methods used in the research are inappropriate for the study | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |

### Outcome Status: Active
### Outcome Type: Student Learning
### Start Date: 08/24/2015
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>contribution of the work.</td>
<td></td>
<td>currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</td>
</tr>
<tr>
<td></td>
<td>-Professionally done: The research is equal in quality to that published in leading journals.</td>
<td></td>
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<tr>
<td></td>
<td>-Well done: The research is equal in quality to that published in second-tier journals.</td>
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</tr>
<tr>
<td></td>
<td>-Acceptable: The research is reasonably done, but not publishable in a journal.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>-Unacceptable: The research was poorly done.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Criterion:</strong> 80% of students receive ratings of 'Professionally Done' or 'Well Done.'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effective Communication - Students can communicate effectively in written form</th>
<th>Dissertation - Each committee member will rate the dissertation for writing quality.</th>
<th>Assessment Cycle: No Action Needed (Prior to 2015-2016)</th>
<th>Action for Improvement: Given our program’s newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome Status:</strong> Active</td>
<td>-Professionally done: The methods used in the research are advancing the discipline.</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Type:</strong> Student Learning</td>
<td>-Well done: The methods used in the research are widely used by professionals for similar purposes.</td>
<td><strong>Results to be added January 31, 2016 (07/02/2015)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Start Date:</strong> 08/24/2015</td>
<td>-Acceptable: The methods used in the research are adequate for the study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Unacceptable: The methods used in the research are inappropriate for the study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Criterion:</strong> &gt;80% of students receive ratings of 'Professionally Done' or</td>
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</tr>
<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td>Actions for Improvement</td>
</tr>
<tr>
<td>---------------------------</td>
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<td>-------------------------</td>
</tr>
<tr>
<td>'Well Done.'</td>
<td></td>
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</tbody>
</table>
| **Dissertation**          | Each committee member will rate the dissertation defense for oral communication ability. | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
| -Professionally done: The oral defense of the thesis is equal to papers presented by top scientists  
-Well done: The oral defense of the thesis is high quality, but not quite at professional standards  
-Acceptable: The oral defense of the thesis meets basic standards for organization and clarity  
-Unacceptable: The oral defense of the thesis is unacceptable for organization and clarity | | |
| **Criterion:** >80% of students receive ratings of 'Professionally Done' or 'Well Done.' | | | |

| **Breadth of knowledge** - Students have demonstrated a thorough fundamental knowledge of topics in Geosciences | **Qualifying Exam** - Each Committee member will rate the qualifying exam. | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Inconclusive  
Results to be added January 31, 2016 (07/02/2015) | Action for Improvement: Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
| Outcome Status: Active  
Outcome Type: Student Learning | -Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding.  
-Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated | | |
<p>| <strong>Start Date:</strong> 08/24/2015 | | | |</p>
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| that understanding beyond the confines of the course. - Adequate understanding: The student has demonstrated adequate understanding of most of the course curriculum, but has demonstrated struggles with portions of the material. - Unacceptable: The student has not demonstrated an adequate understanding of the course material. | **Criterion:** >80% of students receive ratings of 'Holistic Understanding' or 'Thorough Understanding.' **Course Level Assessment:** The instructor of one required course will rate the comprehensive performance of students using papers, exams, and assignments. - Holistic understanding: The student has demonstrated exceptional understanding of the course material, including critical linkages with the current state of research in the discipline, and has further successfully integrated concepts from other coursework to broaden understanding. - Thorough understanding: The student has demonstrated a solid understanding of all of the course material, but has not extrapolated that understanding beyond the confines of the course. - Adequate understanding: The student has demonstrated adequate understanding. | **Assessment Cycle:** No Action Needed (Prior to 2015-2016) **Result Type:** Inconclusive 
Results to be added January 31, 2016 (07/02/2015) | **Action for Improvement:** Given our program's newly revised assessment plan, our program is currently awaiting the end of the fall and spring semesters to analyze new data and formulate an action plan based on the new data (07/02/2015) |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| - Understanding of most of the course curriculum, but has demonstrated struggles with portions of the material.  
  - Unacceptable: The student has not demonstrated an adequate understanding of the course material. | | | |
| **Criterion:** >80% of students receive ratings of ‘Holistic Understanding’ or ‘Thorough Understanding.’ | | | |

| Dissertation Proposal - Dissertation Proposal  
Outcome Status: Inactive  
Outcome Type: Student Learning  
Start Date: 09/01/2006 | Directly related to Objective | Assessment Cycle: No Action Needed (Prior to 2015-2016)  
Result Type: Criterion Met  
No PhD proposals 2010-2011 (08/14/2012) | Action for Improvement: New assessment plan to be implemented in 2015/16. (07/03/2015)  
Action for Improvement: Dissertation advisors encouraged to work more closely with students on proposal (07/02/2015)  
Action for Improvement: Small data set; not statistically relevant. (06/11/2015)  
Action for Improvement: Numbers returning to pre-2012 levels, but students may require more support to define project objectives. (09/18/2014)  
Follow-Up: Evidence of Improvement: insufficient data to conclude if improvement is happening (07/03/2015)  
Action for Improvement: Only | |

| Dissertation - Rubric - Purpose and objectives are clearly stated in the project summary.  
Criterion: Average score above 2.4 | Assessment Cycle: Action In Progress (Prior to 2015-2016)  
Result Type: Inconclusive  
(2007 - 2008) 2.6  
(2008 - 2009) 2.3  
(2009 - 2010) 3.0  
(2011 - 2012) 1.8  
(2012 - 2013) 3.3  
(2013 - 2014) 2.2  
(2014 - 2015) 2.3 (06/11/2015)  
Related Documents:  
Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx | | | |
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation - Rubric - Scientific problem is clearly defined and its relevance is justified. &lt;br&gt; <strong>Criterion:</strong> Average score above 2.4</td>
<td>Assessment Cycle: No Action Needed (Prior to 2015-2016) &lt;br&gt; <strong>Result Type:</strong> Inconclusive &lt;br&gt; (2007 - 2008) 2.7 &lt;br&gt; (2008 - 2009) 2.4 &lt;br&gt; (2009 - 2010) 3.0 &lt;br&gt; (2011 - 2012) 2.1 &lt;br&gt; (2012 - 2013) 1.3 &lt;br&gt; (2013 - 2014) 2.2 &lt;br&gt; (2014 - 2015) 1.8 (06/11/2015) &lt;br&gt; <strong>Related Documents:</strong> Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx</td>
<td></td>
<td>Action for Improvement: One sample this year. While there have been more proposals given in the FY. Intensify efforts to gather data. (08/27/2013)</td>
</tr>
<tr>
<td>Dissertation - Rubric - Methodology and work plan are well presented and feasible.</td>
<td>Assessment Cycle: In Progress (Prior to 2015-2016) &lt;br&gt; <strong>Result Type:</strong> Inconclusive &lt;br&gt; (2007 - 2008) 2.7</td>
<td></td>
<td>Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Insufficient data obtained this year. Continue gathering more data. (09/25/2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Small data set. Not statistically relevant (06/11/2015)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Small data set, but numbers reflect those of years prior to 2013. Continue to collect data. (09/18/2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Only one sample this year. While there have been more proposals given in the FY. Intensify efforts to gather data. (08/27/2013)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)</td>
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<td>Action for Improvement: Insufficient data obtained this year. Continue gathering more data. (09/25/2011)</td>
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<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Small data set; not statistically relevant. (06/11/2015)</td>
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<tr>
<td><strong>Criterion:</strong> Average score above 2.4</td>
<td>(2008 - 2009) 2.5&lt;br&gt;(2009 - 2010) 2.8&lt;br&gt;(2011 - 2012) 2.3&lt;br&gt;(2012 - 2013) 1.0&lt;br&gt;(2013 - 2014) 2.2&lt;br&gt;(2014 - 2015) 2.0 (06/11/2015)</td>
<td><strong>Action for Improvement:</strong> Data collected and shows return to pre-2012 levels. Continue to collect data. (09/18/2014) <strong>Related Documents:</strong> Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx</td>
<td></td>
</tr>
<tr>
<td><strong>Dissertation - Rubric - Proposal is well organized. Illustrations and tables are neatly done.</strong> <strong>Criterion:</strong> Average score above 2.4</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)&lt;br&gt;<strong>Result Type:</strong> Inconclusive&lt;br&gt;(2007 - 2008) 2.4&lt;br&gt;(2008 - 2009) 2.8&lt;br&gt;(2009 - 2010) 2.8&lt;br&gt;(2011 - 2012) 2.6&lt;br&gt;(2012 - 2013) 1.3&lt;br&gt;(2013 - 2014) 2.5&lt;br&gt;(2014 - 2015) 3.0 (06/11/2015)</td>
<td><strong>Action for Improvement:</strong> Small data set; not statistically relevant. (06/11/2015) <strong>Action for Improvement:</strong> Numbers return to pre-2013. Continue to collect data. (09/18/2014) <strong>Related Documents:</strong> Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx</td>
<td></td>
</tr>
<tr>
<td><strong>Dissertation - Rubric - Budget is realistic and well justified.</strong> <strong>Criterion:</strong> Average score above 2.4</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)&lt;br&gt;<strong>Result Type:</strong> Inconclusive&lt;br&gt;(2007 - 2008) 1.7</td>
<td><strong>Action for Improvement:</strong> Small data set; not statistically relevant. (06/11/2015)</td>
<td></td>
</tr>
<tr>
<td>Student Learning Outcomes</td>
<td>Assessment Methods</td>
<td>Results</td>
<td>Actions for Improvement</td>
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</tr>
<tr>
<td><strong>(2008 - 2009)</strong> 2.9</td>
<td></td>
<td></td>
<td><strong>Action for Improvement:</strong> More data collected and performance holding steady. Continue collecting data. (09/18/2014)</td>
</tr>
<tr>
<td><strong>(2009 - 2010)</strong> 2.8</td>
<td></td>
<td></td>
<td><strong>Action for Improvement:</strong> Only one sample this year. While there have been more proposals given in the FY, Intensify efforts to gather data. (08/27/2013)</td>
</tr>
<tr>
<td><strong>(2011 - 2012)</strong> 1.9</td>
<td></td>
<td></td>
<td><strong>Action for Improvement:</strong> Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores. (08/30/2012)</td>
</tr>
<tr>
<td><strong>(2012 - 2013)</strong> 2.5</td>
<td></td>
<td></td>
<td><strong>Action for Improvement:</strong> Insufficient data obtained this year. Continue gathering more data. (09/25/2011)</td>
</tr>
<tr>
<td><strong>(2013 - 2014)</strong> 2.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(2014 - 2015)</strong> 2.0 (06/11/2015)</td>
<td></td>
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</tbody>
</table>

**Related Documents:**
- [Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx](#)

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**Dissertation** - Dissertation

**Outcome Status:** Inactive

**Outcome Type:** Student Learning

**Start Date:** 09/01/2006

**Dissertation** - Rubric - Purpose and objectives are clearly stated in the abstract and the introduction.

**Criterion:** Average score above 2.4

**Assessment Cycle:** Action In Progress (Prior to 2015-2016)

**Result Type:** Inconclusive

- **(2006 - 2007)** 2.2
- **(2007 - 2008)** 2.7
- **(2011 - 2012)** 2.5
- **(2013 - 2014)** 1.9

**Related Documents:**
- [Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx](#)

**Action for Improvement:** Small data set; not statistically relevant. (06/11/2015)

**Action for Improvement:** Students struggling to define project goals; consider a plan to improve student achievement. (09/18/2014)

**Action for Improvement:** No sample gathered this year. While there have been defenses given in the FY, Intensify efforts to gather data. (08/27/2013)

**Action for Improvement:** Continue gathering data (08/30/2012)

**Action for Improvement:** Insufficient data obtained this year. Continue gathering more data. (09/25/2011)
<table>
<thead>
<tr>
<th><strong>Student Learning Outcomes</strong></th>
<th><strong>Assessment Methods</strong></th>
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<th><strong>Actions for Improvement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation - Rubric - Methodology is appropriate and well described.</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016) <strong>Result Type:</strong> Inconclusive</td>
<td>(2006 - 2007) 2.0 (2007 - 2008) 2.6 (2011 - 2012) 2.7 (2013 - 2014) 2.0 (2014 - 2015) 1.5 (06/11/2015)</td>
<td>Action for Improvement: Dissertation advisors encouraged to work more closely with students on explaining research methodology (07/02/2015)</td>
</tr>
<tr>
<td>Dissertation - Rubric - Data gathered are of high quality and analysis is sound.</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016) <strong>Result Type:</strong> Inconclusive</td>
<td>(2006 - 2007) 2.0 (2007 - 2008) 2.6 (2011 - 2012) 2.8 (2013 - 2014) 1.7 (2014 - 2015) 2.0 (06/11/2015)</td>
<td>Action for Improvement: Few data points; continue to collect data and monitor long term trend. (09/18/2014)</td>
</tr>
</tbody>
</table>

Related Documents: [Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx](#)
<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Few data collected, but suggests a negative trend. Consider strategies for improving quality of student collected data. (09/18/2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/27/2013)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Scores continue to improve. No action necessary. (08/30/2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Insufficient data obtained this year. Continue gathering more data. (09/25/2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action for Improvement: Continue gathering data (11/05/2010)</td>
</tr>
</tbody>
</table>

**Assessment Cycle:** Action In Progress (Prior to 2015-2016)

**Result Type:** Inconclusive

| (2006 - 2007) | 3.0 |
| (2007 - 2008) | 2.7 |
| (2011 - 2012) | 2.4 |
| (2013 - 2014) | 2.0 |

**Related Documents:**

- [Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx](#)

**Dissertation - Rubric - Key findings of the work are well presented in the conclusion.**

**Criterion:** Average score above 2.4

**Action for Improvement:** Small data set; not statistically relevant. (06/11/2015)

**Action for Improvement:** Small data set; not statistically relevant. (06/11/2015)

**Action for Improvement:** Few data points, but students may require more guidance; continue to collect data. (09/18/2014)

**Action for Improvement:** No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/27/2013)

**Action for Improvement:** Continue gathering data.
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| **Dissertation - Rubric** | Research is novel and has broad impacts. | Average score above 2.4 | **(08/30/2012)**
| **Assessment Cycle:** Action In Progress (Prior to 2015-2016) | **Result Type:** Inconclusive | **(06/11/2015)**
| **Action for Improvement:** Insufficient data obtained this year. Continue gathering more data. (09/25/2011) | **Action for Improvement:** Few data points; continue to collect data and monitor trends. (09/18/2014) | **Action for Improvement:** No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/27/2013) |
| **Action for Improvement:** Scores are improving. No action necessary. (08/30/2012) | **Action for Improvement:** Insufficient data obtained this year. Continue gathering more data. (09/25/2011) | **Action for Improvement:** continue gathering data (11/05/2010) |

| **Dissertation - Rubric** | Dissertation is well organized. | Average score above 2.4 | **Action for Improvement:** Small data set; not statistically relevant. (06/11/2015) |
| **Assessment Cycle:** Action In Progress (Prior to 2015-2016) | **Result Type:** Inconclusive | **Action for Improvement:** Small data set; not statistically relevant. (06/11/2015) |
| (2006 - 2007) 3.0 | (2007 - 2008) 2.6 | (2011 - 2012) 1.8 |
| **Related Documents:** | **Action for Improvement:** Small data set; not statistically relevant. (06/11/2015) | **Action for Improvement:** Small data set; not statistically relevant. |

01/15/2016
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(06/11/2015)</td>
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<tr>
<td>Action for Improvement:</td>
<td>Few data points,</td>
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<tr>
<td>marginally improving.</td>
<td>Continue to collect</td>
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<td>this year. While there</td>
<td>continue efforts</td>
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<tr>
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<td>year to year. Closer</td>
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<tr>
<td>supervision of the</td>
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<td>result in consistently</td>
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<td>(11/05/2010)</td>
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<td>(2006 - 2007) 3.0</td>
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<td>(2007 - 2008) 3.0</td>
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<td>(2011 - 2012) 2.9</td>
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<td>(2013 - 2014) 2.5</td>
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<td>(2014 - 2015) 3.0</td>
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<td>(06/11/2015)</td>
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<td>Few data points, but trends are</td>
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<td></td>
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<td>negative. Consider strategies for</td>
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<td>(08/30/2012)</td>
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<td>(2014 - 2015)</td>
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<tr>
<td>Result Type:</td>
<td>Action for Improvement:</td>
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<td>(2006 - 2007)</td>
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<td>3.0</td>
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<td>(2007 - 2008)</td>
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<td>2.7</td>
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<td>(2011 - 2012)</td>
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<td>1.8</td>
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<td>2.5</td>
<td>Continue gathering data. (08/30/2012)</td>
</tr>
<tr>
<td>(2014 - 2015)</td>
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<td>2.5 (06/11/2015)</td>
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<td>Action for Improvement:</td>
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<td>Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx</td>
<td>continue gathering data (11/05/2010)</td>
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01/15/2016
<table>
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<tr>
<th><strong>Student Learning Outcomes</strong></th>
<th><strong>Assessment Methods</strong></th>
<th><strong>Results</strong></th>
<th><strong>Actions for Improvement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dissertation</strong> - Rubric - Work has been (is being) published or presented in a reputable venue.</td>
<td><strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016)</td>
<td>Geosciences_MS-PhD_tracedat_matrices_06_07.xlsx</td>
<td>(06/11/2015) (09/18/2014) Action for Improvement: Few data, but improvement observed. Continue to collect data.</td>
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<tr>
<td><strong>Criterion:</strong> Average score above 2.4</td>
<td><strong>Result Type:</strong> Inconclusive</td>
<td>(2006 - 2007) 1.0 (2007 - 2008) 2.5 (2011 - 2012) 2.8 (2013 - 2014) 1.5 (2014 - 2015) 1.5 (06/11/2015)</td>
<td>(08/27/2013) Action for Improvement: No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/30/2012) Action for Improvement: Scores fluctuate year to year. Closer supervision of the students' research may result in consistently high scores.</td>
</tr>
<tr>
<td><strong>Related Documents:</strong></td>
<td><em><strong>Geosciences_MS-PhD_tracedat_matrices_06_07.xlsx</strong></em></td>
<td></td>
<td>(09/25/2011) Action for Improvement: Insufficient data obtained this year. Continue gathering more data.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(11/05/2010) Action for Improvement: continue gathering data</td>
</tr>
</tbody>
</table>

*Action for Improvement: New assessment plan to be implemented in 2015/16. Intensify effort to collect data.* (07/03/2015)

*Action for Improvement: Small data set; not statistically relevant.* (06/11/2015)

*Action for Improvement: Some data collected, but suggests difficulties in translating PhD research into publications. Continue to collect data.* (09/18/2014)

*Follow-Up: Evidence of Improvement: still have*
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| **Oral Defense** - Oral Defense | Directly related to Objective | Assessment Cycle: No Action Needed (Prior to 2015-2016) | insufficient data to determine if improvement is happening. 
(07/03/2015) |
<p>| <strong>Outcome Status:</strong> Inactive | <strong>Outcome Type:</strong> Student Learning | Result Type: Criterion Met | Action for Improvement: No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/27/2013) |
| <strong>Start Date:</strong> 09/01/2006 | <strong>Dissertation - Rubric - Presentation was well organized, smoothly delivered, and on time.</strong> | <strong>Criterion:</strong> Average score above 2.4 | Action for Improvement: Scores are improving. No action necessary. (08/30/2012) |
| | <strong>Assessment Cycle:</strong> Action In Progress (Prior to 2015-2016) | <strong>Result Type:</strong> Inconclusive | Action for Improvement: Insufficient data obtained this year. Continue gathering more data. (09/25/2011) |
| | <strong>(2006 - 2007) 2.5</strong> | <strong>(2007 - 2008) 2.2</strong> | Action for Improvement: Continue gathering data (11/05/2010) |
| | <strong>(2009 - 2010) 2.7</strong> | <strong>(2011 - 2012) 2.3</strong> | |
| | <strong>Related Documents:</strong> | | |
| | <em>Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx</em> | | |</p>
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
<th>Results</th>
<th>Actions for Improvement</th>
</tr>
</thead>
</table>
| **Dissertation** - Rubric - Visual aids were effective and of high quality. **Criterion:** Average score above 2.4 | **Assessment Cycle:** Action In Progress (Prior to 2015-2016)  
**Result Type:** Inconclusive  
(2006 - 2007) 2.7  
(2007 - 2008) 2.4  
(2009 - 2010) 2.7  
(2011 - 2012) 2.4  
(2013-2014) 2.8  
(2014 - 2015) 2.4 (06/11/2015) | **Related Documents:**  
Geosciences_MS-PhD_tracdat_matrices_06_07.xlsx | Insufficient data obtained this year. Continue gathering more data. (09/25/2011) |

**Action for Improvement:** Small data set; statistically not relevant. (06/11/2015)  
**Action for Improvement:** Few data points, but students evaluating well. Identify disconnect between visual aids in thesis and visual aids in defense. (09/18/2014)  
**Action for Improvement:** No sample gathered this year. While there have been defenses given in the FY. Intensify efforts to gather data. (08/27/2013)  
**Action for Improvement:** Continue gathering data. (08/30/2012)  
**Action for Improvement:** Insufficient data obtained this year. Continue gathering more data. (09/25/2011)  
**Action for Improvement:** Small data set; statistically not relevant. (06/11/2015)  
**Action for Improvement:** Continue to collect data to identify cause of fluctuations. (09/18/2014)  
**Follow-Up: Evidence of Improvement:** Assessment plan will be new starting in 2015/16. (07/03/2015)  
**Action for Improvement:** No sample gathered this year. While there have been defenses given this year.
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Actions for Improvement</strong>: the FY. Intensify efforts to gather data. (08/27/2013)</td>
<td><strong>Action for Improvement</strong>: Continue gathering data. (08/30/2012)</td>
<td><strong>Action for Improvement</strong>: Insufficient data obtained this year. Continue gathering more data. (09/25/2011)</td>
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</table>
APPENDIX J

SYLLABI CROSS-LISTED COURSES (TANDEM)

SEE ATTACHED
GIS in Natural Science and Engineering

GEOL 3428-001 (lecture)  
GEOL 3428-005 (non-credit lab)  
The lecture and the lab must be taken together.

Hours (lectures):  
MW 2:00-3:20 p.m. (SC234)
(non-credit labs):  
M 3:30-6:20 p.m. (SC203)

Office hours:  
By appointment (any questions directly related to the lecture and lab materials are answered during the lab hours)

Instructor:  
Seiichi Nagihara  
Office: Room 314, Science Bldg.  
Phone: 806-742-3149  
E-mail: seiichi.nagihara@ttu.edu

This course satisfies the Technology & Applied Science core curriculum requirement.

Course Objectives & Description:

Students graduating from Texas Tech University should be able to demonstrate understanding of how technology and applied science affects society and the environment and to demonstrate understanding of the relationship of ethics and technology. The objective of the technology and applied science component of a core curriculum is to enable the student to understand how profoundly scientific and technological developments affect society and the environment.

GIS in Natural Science and Engineering is an introductory course on geographic information systems (GIS) and global navigation satellite systems (GNSS) designed mainly for students in natural science and engineering. The course intends to cover a broad spectrum of geo-information science & technology ranging from the cartography, thematic mapping, GIS data formats, field data acquisition using GPS, mobile GIS, the hardware and software in GIS, database management, elementary spatial analyses and digital image processing.

In the lecture component, students will gain theoretical knowledge of GIS, GNSS and the technologies behind them. In the lab component, students will go through a series of computer exercises, using real-world environmental and geologic data. ArcGIS Desktop (Environmental Systems Research Institute, Inc.) will be the main GIS software tool for the exercises.


Lab Manual: Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor, and ArcInfo 2nd edition, Updated for ArcGIS 9.3 by T. Ormsby and others, Environmental Science Research Institute, Inc.

Prerequisite: Freshman-level college algebra
Grading:

Students will be graded on their performances in two closed-book tests, two sets of homework assignments, and weekly lab assignments. The test questions will evaluate students' theoretical understanding of GIS, GNSS, and cartography. The homework assignments will be carried out on computers using ArcGIS. The lab assignments are computer exercises from the lab manual.

<table>
<thead>
<tr>
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<th>Time Allowed</th>
<th>Percentage contribution to the Final Grade</th>
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<tbody>
<tr>
<td>Test #1 Bolstad, Ch. 1-5</td>
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<td>15%</td>
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<tr>
<td>Test #2 Bolstad, Ch. 6-11, 13-15</td>
<td>1 hour</td>
<td>15%</td>
</tr>
<tr>
<td>HW #1 Ormsby, Ch. 1-9</td>
<td>3 weeks</td>
<td>25%</td>
</tr>
<tr>
<td>HW #2 Ormsby Ch. 1-19</td>
<td>3 weeks</td>
<td>25%</td>
</tr>
<tr>
<td>Weekly lab assignments</td>
<td>1 week</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Expected Learning Outcomes**

| Students can determine basic geospatial relationships (direction, distance, area size, elevation/altitude etc.) between objects drawn on paper maps and apply the knowledge in real-world settings. | Test questions and assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met. |
| Students can produce various types of thematic maps (streets, land parcels, area size, elevation, etc.) using the ArcGIS software, if given necessary geospatial datasets. | Assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met. |
| Students can determine basic geospatial relationships (direction, distance, area size, elevation/altitude, etc.) between objects on computer-produced maps by using proper GIS tools. | Assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met. |
| Students can perform basic statistical analyses using geospatial datasets with the ArcGIS software. | Assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met. |
| Students demonstrate understanding of how the rapid pace of change in geo-information technologies may impact human societies and natural environment (negatively and positively). | Test questions will be given to evaluate the student’s understanding. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met. |
Disabilities

Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible so the necessary accommodations can be made.

Absence in Observance of Religious Holy Days

Due to the recent changes in the state law, students are no longer required to notify in advance of their absence for the purpose of observing a religious holy day.

Outlook of the Semester

<table>
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<tr>
<th>Week</th>
<th>Dates</th>
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<td>8/31-9/2</td>
<td>Lecture-M: Ch.1: Introduction to GIS</td>
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<td>Lecture-W: Ch.2: Data Models</td>
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<td>9/7-9/9</td>
<td><strong>Labor Day Monday</strong></td>
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<td></td>
<td>Lecture-W: Ch.3 Map Projections and Coordinate Systems</td>
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<tr>
<td>3</td>
<td>9/14-9/16</td>
<td>Lecture-M: Ch.3 Map Projections and Coordinate Systems</td>
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<tr>
<td></td>
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<td>Lecture-W: Network Computing</td>
</tr>
<tr>
<td>4</td>
<td>9/21-9/23</td>
<td>Lecture-M: Ch.4 Maps and Data Entry</td>
</tr>
<tr>
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<td>Lecture-W: Thematic Mapping</td>
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<td>Labs: Ch.1-4 Getting Started with Maps and Data</td>
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<td>9/28-9/30</td>
<td>Lecture-M: Ch.5 GNSS</td>
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<td></td>
<td>Lecture-W: Ch.6 Aerial and Satellite Images</td>
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<td>Lab: Ch.5-7 Displaying Data</td>
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<tr>
<td>6</td>
<td>10/5-10/7</td>
<td>Lecture-M: <strong>Test #1</strong></td>
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<td>Lecture-W: Ch.7 Digital Data</td>
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<td>Lab: GPS &amp; Mobile GIS</td>
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<td>10/12-10/14</td>
<td>Lecture-M: <strong>Fall Break</strong></td>
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<td>Lecture-W: Ch.7 Digital Data - Internet GIS resources &amp; tools</td>
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<td></td>
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<td>No Labs</td>
</tr>
<tr>
<td>8</td>
<td>10/19-10/21</td>
<td>Lecture-MW: Ch.8 Attribute Data and Tables</td>
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<td></td>
<td></td>
<td>Lab: Ch.8-9 Getting Information about Features <strong>Homework #1 out</strong></td>
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<tr>
<td>9</td>
<td>10/26-10/28</td>
<td>Lecture-MW Ch.9 Basic Spatial Analyses</td>
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<tr>
<td></td>
<td></td>
<td>Lab: Ch. 10-11 Analyzing Feature Relationships, Pt. 1</td>
</tr>
<tr>
<td>10</td>
<td>11/2-10/4</td>
<td>Lecture-MW: Ch. 10 Raster Analysis</td>
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<tr>
<td></td>
<td></td>
<td>Lab: Ch.12-13 Analyzing Feature Relationships, Pt. 2</td>
</tr>
<tr>
<td>11</td>
<td>11/9-11/11</td>
<td>Lecture-MW: Ch.11 Terrain Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab: Ch. 14-16 Creating and Editing Data <strong>Homework #1 due</strong></td>
</tr>
<tr>
<td>12</td>
<td>11/16-11/18</td>
<td>Lecture-M: Ch.13 Spatial Modeling</td>
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<td></td>
<td></td>
<td>Lecture-W: Ch.14 Data Standards and Data Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab: Ch.18-19 Presenting Data <strong>Homework #2 out</strong></td>
</tr>
<tr>
<td>13</td>
<td>11/23-11/25</td>
<td>Lecture-M: Ch.15 New Development in GIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Thanksgiving Weekend</strong>, No lab</td>
</tr>
<tr>
<td>14</td>
<td>11/30-12/2</td>
<td>Lecture-M: Ch.15 New Development in GIS-LIDAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lecture-W: <strong>Test #2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab: Ch. 17 Geocoding addresses</td>
</tr>
<tr>
<td>15</td>
<td>12/7-12/9</td>
<td>Lecture-MW: Examples of practical GIS applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab: just work on the homework</td>
</tr>
<tr>
<td></td>
<td>12/11</td>
<td><strong>Homework #2 due</strong></td>
</tr>
</tbody>
</table>
GIS in Natural Science and Engineering

GEOL 5428-001 (lecture)  
GEOL 5428-005 (non-credit lab)  
The lecture and the lab must be taken together.

Hours (lectures):  
MW 2:00-3:20 p.m.  
(non-credit labs):  
W 3:30-6:00 p.m.

Office hours:  
By appointment (any questions directly related to the lecture and lab materials are answered during the lab hours)

Instructor:  
Seiichi Nagihara  
Office: Room 314, Science Bldg.  
Phone: 806-742-3149  
E-mail: seiichi.nagihara@ttu.edu

Course Objectives & Description:

GIS in Natural Science and Engineering is an introductory course on geographic information systems (GIS) and global navigation satellite systems (GNSS) designed mainly for students in natural science and engineering. The course intends to cover a broad spectrum of geo-information science & technology ranging from the cartography, thematic mapping, GIS data formats, field data acquisition using GPS, mobile GIS, the hardware and software in GIS, database management, elementary spatial analyses and digital image processing.

In the lecture component, students will gain theoretical knowledge of GIS, GNSS and the technologies behind them. In the lab component, students will go through a series of computer exercises, using real-world environmental and geologic data. ArcGIS Desktop (Environmental Systems Research Institute, Inc.) will be the main GIS software tool for the exercises.

Textbook:  
GIS Fundamentals, 3rd edition by Paul Bolstad, Atlas Books

Lab Manual:  
Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor, and ArcInfo 2nd edition, Updated for ArcGIS 9.3 by T. Ormsby and others, Environmental Science Research Institute, Inc.

Prerequisite:  
graduate standing
Grading:

Students will be graded on their performances in two closed-book tests, two sets of homework assignments, and weekly lab assignments. The test questions will be theoretical understanding of GIS, GNSS, and cartography. The homework assignments will be carried out on computers using ArcGIS. The lab assignments are computer exercises from the lab manual.

<table>
<thead>
<tr>
<th></th>
<th>Time Allowed</th>
<th>Percentage contribution to the Final Grade</th>
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</thead>
<tbody>
<tr>
<td>Test #1</td>
<td>1 hour</td>
<td>15%</td>
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<tr>
<td>Bolstad, Ch. 1-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test #2</td>
<td>1 hour</td>
<td>15%</td>
</tr>
<tr>
<td>Bolstad, Ch. 6-11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW #1</td>
<td>3 weeks</td>
<td>25%</td>
</tr>
<tr>
<td>Ormsby, Ch. 1-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW #2</td>
<td>3 weeks</td>
<td>25%</td>
</tr>
<tr>
<td>Ormsby Ch. 1-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly lab assignments</td>
<td>1 week</td>
<td>20%</td>
</tr>
</tbody>
</table>

Expected Learning Outcomes

- Students can determine basic geospatial relationships (direction, distance, area size, elevation/altitude etc.) between objects drawn on paper maps and apply the knowledge in real-world settings.
- Students can produce various types of thematic maps (streets, land parcels, area size, elevation, etc.) using the ArcGIS software, if given necessary geospatial datasets.
- Students can determine basic geospatial relationships (direction, distance, area size, elevation/altitude, etc.) between objects on computer-produced maps by using proper GIS tools.
- Students can perform basic statistical analyses using geospatial datasets with the ArcGIS software.
- Students demonstrate understanding of how the rapid pace of change in geo-information technologies may impact human societies and natural environment (negatively and positively).

Methods to Assess The Outcomes

- Test questions and assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met.
- Assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met.
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- Assignments (homework and lab) will be given to evaluate the student’s ability. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met.
- Test questions will be given to evaluate the student’s understanding. The instructor will perform principal trait analyses on the students’ scores and evaluate how well the goal is met.
**Disabilities** Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible so the necessary accommodations can be made.

**Absence in Observance of Religious Holy Days** Due to the recent changes in the state law, students are no longer required to notify in advance of their absence for the purpose of observing a religious holy day.

**Outlook of the Semester**

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Materials Covered</th>
</tr>
</thead>
</table>
| 1    | 8/31-9/2    | Lecture-M: Ch.1: Introduction to GIS  
Lecture-W: Ch.2: Data Models                                                     |
| 2    | 9/7-9/9     | *Labor Day Monday*  
Lecture-W: Ch.3 Map Projections and Coordinate Systems                            |
| 3    | 9/14-9/16   | Lecture-M: Ch.3 Map Projections and Coordinate Systems  
Lecture-W: Network Computing                                                       |
| 4    | 9/21-9/23   | Lecture-M: Ch.4 Maps and Data Entry  
Lecture-W: Thematic Mapping  
Labs: Ch.1-4 Getting Started with Maps and Data                                     |
| 5    | 9/28-9/30   | Lecture-M: Ch.5 GNSS  
Lecture-W: Ch.6 Aerial and Satellite Images  
Lab: Ch.5-7 Displaying Data                                                        |
| 6    | 10/5-10/7   | Lecture-M: Test #1  
Lecture-W: Ch.7 Digital Data  
Lab: GPS & Mobile GIS                                                                |
| 7    | 10/12-10/14 | Lecture-M: Fall Break  
Lecture-W: Ch.7 Digital Data - Internet GIS resources & tools  
No Labs                                                                          |
| 8    | 10/19-10/21 | Lecture-MW: Ch.8 Attribute Data and Tables  
Lab: Ch.8-9 Getting Information about Features  
*Homework #1 out*                                                                   |
| 9    | 10/26-10/28 | Lecture-MW Ch.9 Basic Spatial Analyses  
Lab: Ch.10-11 Analyzing Feature Relationships, Pt. 1                                |
| 10   | 11/2-10/4   | Lecture-MW: Ch. 10 Raster Analysis  
Lab: Ch.12-13 Analyzing Feature Relationships, Pt. 2                                |
| 11   | 11/9-11/11  | Lecture-MW: Ch.11 Terrain Analysis  
Lab: Ch. 14-16 Creating and Editing Data  
*Homework #1 due*                                                                  |
| 12   | 11/16-11/18 | Lecture-M: Ch.13 Spatial Modeling  
Lecture-W: Ch.14 Data Standards and Data Quality  
Lab: Ch.18-19 Presenting Data  
*Homework #2 out*                                                                 |
| 13   | 11/23-11/25 | Lecture-M: Ch.15 New Development in GIS  
*Thanksgiving Weekend*, No lab                                                      |
| 14   | 11/30-12/2  | Lecture-M: Ch.15 New Development in GIS-LIDAR  
Lecture-W: Test #2  
Lab: Ch. 17 Geocoding addresses                                                   |
| 15   | 12/7-12/9   | Lecture-MW: Examples of practical GIS applications  
Lab: just work on the homework  
*Homework #2 due*                                                                   |
|      | 12/11       |                                                                                  |
GEOL 4321/GEOL 5300  IGNEOUS AND METAMORPHIC PETROGRAPHY  
Spring 2010

Textbook  An Introduction to Igneous and Metamorphic Petrology, J.D. Winter  
Helpful lab books  A color atlas of rocks and minerals in thin section, MacKenzie & Adams  
Minerals in Thin Section, Perkins & Henke  
Petrography, Williams, Turner, & Gilbert  
An Introduction to the Rock Forming Minerals, Deer, Howie, & Zussman

Helpful lecture book  Any modern petrology text.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Igneous Rocks/Magmatism</strong></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
<td>Intro; basic concepts; classification</td>
<td>Winter Ch. 1, 2</td>
</tr>
<tr>
<td>Week 2</td>
<td>Thermodynamics</td>
<td>Winter Ch. 5, 6</td>
</tr>
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<td></td>
<td>Unary and binary systems</td>
<td>Winter Ch. 6</td>
</tr>
<tr>
<td>Week 3</td>
<td>Crystal nucleation and growth, magma properties</td>
<td>Winter Ch. 3, 4</td>
</tr>
<tr>
<td>Week 4</td>
<td>Ternary systems</td>
<td>Winter Ch. 7, 10</td>
</tr>
<tr>
<td>Week 5</td>
<td>Igneous processes and geochemistry</td>
<td>Winter Ch. 8, 9, 11</td>
</tr>
<tr>
<td>Week 6</td>
<td>Application of isotope systematics, magma sources</td>
<td>Winter Ch. 9, 18</td>
</tr>
<tr>
<td></td>
<td>Igneous associations</td>
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<tr>
<td>Week 7</td>
<td><strong>Exam due October 14</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Classification of metamorphic rocks</td>
<td>Winter Ch. 22, 23</td>
</tr>
<tr>
<td></td>
<td>Metamorphic reactions, textures facies</td>
<td>Winter Ch. 24, 25</td>
</tr>
<tr>
<td>Week 9</td>
<td>Thermo and metamorphic rocks (P-T-t)</td>
<td>Winter Ch. 26, 27</td>
</tr>
<tr>
<td>Week 10</td>
<td>Metapelites</td>
<td>Winter Ch. 28</td>
</tr>
<tr>
<td>Week 11</td>
<td>Metacarbonates</td>
<td>Winter Ch. 29</td>
</tr>
<tr>
<td>Week 12</td>
<td>Meta-ultramafic rocks</td>
<td>Winter Ch. 29</td>
</tr>
<tr>
<td></td>
<td>Metasomatism</td>
<td>Winter Ch. 30</td>
</tr>
<tr>
<td>Week 13</td>
<td>Crustal melting and granites</td>
<td>Winter Ch. 18</td>
</tr>
<tr>
<td></td>
<td>Thanksgiving holiday (Nov. 27)</td>
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<tr>
<td>Week 14</td>
<td>Crustal melting and granites</td>
<td>Winter Ch. 18</td>
</tr>
<tr>
<td>May 7</td>
<td><strong>FINAL EXAM</strong> 1:30 p.m. to 4:00 p.m.</td>
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</table>

Grading:
Labour problem sets (25%) and exams (25%)
Labour exercises (25%) and exams (25%)

Professor  Calvin G. Barnes  328 Science  cal.barnes@ttu.edu  
office hours in lab and by appointment
TA  Nolwenn Coint  334 Science  Nolwenn.coint@ttu.edu
office hours in lab and MW 10:00-11:00 AM

Lab plan:

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Jan. 19 &amp; 21</td>
<td>Survey of igneous minerals and textures</td>
</tr>
<tr>
<td>2.</td>
<td>Jan. 26 &amp; 28</td>
<td>Oceanic basalt (Hawaii)</td>
</tr>
<tr>
<td>3.</td>
<td>Feb. 2 &amp; 4</td>
<td>Layered mafic intrusions (Bushveld complex)</td>
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<tr>
<td>4.</td>
<td>Feb. 9 &amp; 11</td>
<td>Calc-alkaline volcanic rocks (Crater Lake)</td>
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<tr>
<td>5.</td>
<td>Feb. 16 &amp; 18</td>
<td>Calc-alkaline intrusive rocks</td>
</tr>
<tr>
<td>6.</td>
<td>Feb. 23 &amp; 25</td>
<td>Alkaline volcanic rocks</td>
</tr>
<tr>
<td>March 2</td>
<td></td>
<td>Lab preparation</td>
</tr>
<tr>
<td>March 4</td>
<td></td>
<td>LAB EXAM</td>
</tr>
<tr>
<td>7.</td>
<td>Mar. 9 &amp; 11</td>
<td>Alkaline intrusive rocks</td>
</tr>
<tr>
<td>8.</td>
<td>Mar. 23 &amp; 25</td>
<td>Intro. to metamorphic rocks</td>
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<tr>
<td>9.</td>
<td>Mar. 30 &amp; Apr 1</td>
<td>Metabasic and meta-ultramafic rocks</td>
</tr>
<tr>
<td>April 8</td>
<td></td>
<td>Field trip</td>
</tr>
<tr>
<td>10.</td>
<td>Apr 13 &amp; 15</td>
<td>Metapelitic rocks and metacarbonates</td>
</tr>
<tr>
<td>11.</td>
<td>Apr 20 &amp; 22</td>
<td>High-grade metamorphic rocks</td>
</tr>
<tr>
<td>APRIL 29</td>
<td></td>
<td>LAB EXAM</td>
</tr>
</tbody>
</table>
Purpose.
This class involves the study of igneous and metamorphic rocks with the use of the petrographic microscope. It emphasizes petrographic identification of rock-forming minerals, characterization of mineral habits and textures, and the relationships between textural information and mineral growth history. As such, the course also presents and relies on theoretical and experimental data.

Expected learning outcomes include, but are not limited to:
1. Ability to identify the common igneous and metamorphic minerals, and to determine/estimate compositions of rock-forming minerals using the petrographic microscope.
2. Ability to integrate textural features of igneous rocks to chemical, theoretical, and experimental information, with the goal of understanding the conditions and processes of magma formation, differentiation, and crystallization.
3. Ability to use mineral and textural data to (a) estimate the protolith of the metamorphic rock, (b) estimate peak conditions of metamorphism, (c) estimate the metamorphic field gradient of a suite of metamorphic rocks, and (d) determine prograde from retrograde mineral assemblages.
4. Be able to demonstrate the relationships between texture, mineral assemblage, and phase equilibrium data for igneous and metamorphic rocks.

Assessment.
Numerical assessment of learning outcomes will be primarily by a quiz-style exercise given at the beginning and the end of the class. Qualitative assessments are made on the following basis:
1. Lecture exercises permit evaluation of student understanding of theoretical and experimental constraints on magma formation and crystallization and on sequences of prograde metamorphic mineral assemblages.
2. Lab exercises permit evaluation of students’ ability to identify rock-forming minerals, recognize specific textures, and interpret these data in terms of established equilibrium phase relationships.
3. The lab format—free-form with the instructor/TA present—results in direct interaction with students and the ability to evaluate their understanding of optical mineralogy, their ability to identify rock-forming minerals, and their understanding of petrogenetic processes.

Any student who, because of a disabling condition may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible so that the necessary accommodations can be made.

Observance of a Religious Holy Day.

Texas House Bill 256 requires institutions of higher education to excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day. The student shall also be excused for time necessary to travel. An institution may not penalize the student for the absence and allows for the student to take an exam or complete an assignment from which the student is excused. No prior notification of the instructor is required.
GPH4321 and GPH5321 – Geophysics; 9:30 – 10:50PM T, 9:30-12:30PM TH,
Harold Gurrola, email harold.gurrola@ttu.edu
lab: This class is very much designed to be a lab class with the lecture primarily supporting the the
material needed for lab each week.
Text: Applied Geophysics, by Telford et al.
Office hours: by appointment

Grading:
Midterm Exam: 20 points. 7:30AM -10:00 AM Wednesday Dec14
Final Exam 20 points and is cumulative.
Quizzes: 20 points
Homework/labs/presentations: 40 points

Grading scale:
A+> 96%, A>93%, A- >90, B+>87%, B>83%, B->80%,C+>77%, C>73%, C->70%, D+ >67%, D >63%,
D- >60%, less than 60% will be an F.

Topics:
1) Stress and strain
2) Wave equation
3) Ray theory
4) Partitioning of energy at an interface
5) Seismic equipment
6) Seismic field operation
7) Digital data processing
   a) frequency domain/Fourier transform
   b) correlation
   c) deconvolution
8) Exploration seismology:
   a) refraction work
   b) reflection work
     i) deployment design
     ii) data processing (reflection)
     iii) 2-D interpretation
     iv) 3-D interpretation
9) GPR

Lab will include practical problems related to seismic wave propagation, data processing and
interpretation related.
All students will be required to participate in field projects (Saturdays, Sundays or by arrangement) in the
field (all day-possibly 8AM to 10 PM) to collect seismic or GPR data.
LAB schedule (tentative; We may move some of the labs back a week to accommodate field project.

Week 2: (materials needed, ruler, graph paper, calculator)
Lab1: One-D seismic wave propagation: The student will be given a simple geologic model and will be expected to produce a synthetic seismogram for this velocity model using a delta function source (unit impulse). This will be analogous to producing a synthetic seismogram from a very simple well log. They will save the result from this project to use later to convolve the synthetic with seismic source functions when we cover data processing.
Theory that will be covered in class before this project: stress and strain in 1-D, derive and solve 1-D wave equation, seismic velocity and reflection coefficient.

Week 3, 4, 5 (materials needed, ruler, protractor, graph paper, calculator)
Lab2: 2-D (or 3-D) seismic wave propagation: The student will be given a 2-D geologic model (some students may be assigned a simple 3-D model) and they will trace rays through it by hand assuming the exploding reflector analogy. This lab will be spread over three weeks. The first week will be to trace the primary waves assuming exploding reflector and compute arrival times. The second week they will add amplitudes to the figure. The third week they will add multiples and put the seismic section into excel as a digital data set.
Theory to be covered to accompany this will be 3-D stress, strain and wave equation; snells law, amplitude and transmission coefficients.

Week 6, 7 (in computer lab)
Lab3: AVO, P-to-S conversions and CMP (gathers, normal moveout and field records). This lab will require using excel or Matlab to compute synthetic seismograms for a cmp and a simple one dimensional velocity model. In the first week we will compute travel times for the various offsets by ray tracing through the velocity model and computing Snell’s law at each interface. The second week we will add amplitudes to the CMP and discuss how amplitudes change with offset and how this can be related to lithology and direct detection of hydrocarbon.
Theory necessary: field layout, CMP gathers, normal moveout equation, Zoeprit’s equations, average velocity, RMS velocity, slowness, ray parameter etc.

Week 8, 9 (in computer lab)
Lab 4, Digital data and frequency vs time domain: In the first week the class will use programs I provide in Matlab to model different source functions as the sum of sine or cosine waves. We will have projects to illustrate power spectrum and aliasing. In the second week the class will use the synthetic seismic data they produced in the first two labs and convolve it with the source functions. They will add noise and then use deconvolution and cross-correlation to remove the source and discuss the side effect and benefits of these two methods to remove source function.
Theory: digital data theory and sampling, z-transform, fourier series and transform, correlation and deconvolution.

Week 10 (in computer lab)
Lab 5: Seismic data processing and velocity analysis. We will use a simple processing package to do velocity analysis and CMP stacking of either a small seismic data set or GPR data.

Week 11, 12, 13, 14 (material, color pencils, eraser)
seismic interpretation projects.
Expected Learning outcomes

Upon completion of the course the students will be able to:
1) Understand the wave equation and propagation.
2) Understand and use seismic methods in exploring Earth structure.
3) Understand basic time series analysis and seismic data processing
4) Be familiar with seismic reflection and refraction interpretation.
5) Be familiar with seismic field operations and equipment.

Methods of assessing outcomes

1) Evaluating progress in homework. Homework will be presented in class. Class discussion will therefore provide a continual assessment of the level of understanding and retention of material covered in the homework.
2) The quizzes will be an important component in assessment. We will have a quiz on the day most lab or homework assignments are due. The quizzes are intended as a measure of how well the students understand the homework or lab assignments.
3) Exams: there will be an exam the first week of class and during the last week of class to assess learning outcomes.

Absences:
While role is not taken absences on days with a quiz or test will not be excused except due to illness (with doctor note), official approved trips and religious observances. In accordance with Texas Tech Catalogue prior notification of such absences will be required.

Special Arrangements:
Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the professor at the beginning of the semester so that accommodations can be made. Student must typically register with Student Disability Services.
1) Course Syllabus

A) Basic Course Information

Professor: David Leverington

Lectures: Lectures held in Science 204 on Mon/Wed, from 11:00 – 11:50 am
Labs: 2:30 to 5:20 pm on Mon/Wed (depending on section) in SC 322
Office Hrs: SC 316, Mon/Wed, from 10:00 – 10:45 am, or by appointment
Email: david.leverington@ttu.edu
Phone: (806) 742-1603
Web: http://www.webpages.ttu.edu/dleverin/

Textbook: Remote Sensing and Image Interpretation, Lillesand, Kiefer, and Chipman
(John Wiley and Sons, Sixth Edition)

Remote sensing is the gathering of information regarding an object of interest without
direct physical contact with that object. In the earth sciences, this usually involves the
use of photographic or electronic imaging to detect and differentiate surface materials.

Digital Imagery in the Geosciences is an introductory course in remote sensing. Emphasis is on general remote-sensing principles, including aspects of the nature of
electromagnetic radiation, the spectral-response curves of earth materials, and a review of
remote-sensing sensors and orbiting platforms. Numerous basic image-processing
techniques are introduced in this course, including image enhancement, image
gereferencing, and image classification. Topics such as planetary remote sensing and
the use of remotely-sensed topography in the study of terrestrial surface processes will
also be introduced.

No previous experience in remote sensing is assumed, although students are expected to
have basic skills in computer usage and to have completed introductory mathematics
courses at the first-year level. The main software package used in this course is PCI
Geomatica, but ESRI’s ArcGIS may also be used to support certain lab exercises.

In this course, lecture materials emphasize theoretical concepts whereas lab exercises
emphasize practical tools. Due to space constraints, two main lab sessions are offered
(Mon. and Wed.). In order to properly accommodate everyone, students are normally
assigned a particular lab time either on Monday or Wednesday afternoon. Additional
access to the lab room can be provided (by advance arrangement with the professor).
B) Expected Learning Outcomes

Upon completion of this introductory course:

1) Students will have a general understanding of fundamental remote sensing concepts such as the electromagnetic spectrum, blackbody radiation, atmospheric windows, and spectral response curves.

2) Students will have a basic appreciation for the history of development of photographic and digital remote sensing technology.

3) Students will have an understanding of the nature of the main types of digital remote-sensing sensors, including important optical, thermal, and microwave remote sensing systems that are presently operational.

4) Students will understand how to apply basic principles of digital image processing toward the extraction of information from remote-sensing databases; these principles include those of image enhancement, query, filtering, georeferencing, classification, and arithmetic.

5) Students will have been exposed to elementary methods of processing of remotely-sensed topographic databases.

6) Students will appreciate the practical value of remote sensing in the study of the Earth as well as in the exploration of other solar system bodies.

C) Outcomes Assessment

Assessments of learning will be based on three exams and eight (8) lab exercises. Additionally, there will be an optional comprehensive extra exam that can replace one of the regular exams (e.g., for those who wish to try to improve their final grade by replacing their poorest exam result with a better result, or for those who missed an exam earlier in the term for an unofficial reason). The optional extra exam will cover all material covered in the semester. Exams will be based on materials presented in the lectures, labs, and assigned readings.

Exams typically consist of multiple choice questions, fill-in-the-blank questions, and short-answer + long-answer questions.

In addition to the exams, assessments of learning will be made throughout the semester on the basis of periodic quizzes that do not affect student grades.
D) Grading

The final course grade will be based on A) the best 3 exam results, with each exam worth 20% of the final grade (total = 60% of final grade); and B) the 8 lab exercises, with each lab worth 5% (total = 40% of final grade). Unless otherwise noted the lab exercises will be due one week after the relevant lab session, and lab grades will be penalized 20% (=1% of final course grade) per late day.

The grading scale is as follows: 
- A (90-100%)
- B (75-89.9%)
- C (60-74.9%)
- D (50-59.9%)
- F (0-49.9%)

The exam dates are:
- Exam 1: Wed., February 17: 11:00 – 11:50 am, Room 204
- Exam 2: Wed., March 31: 11:00 – 11:50 am, Room 204
- Exam 3: Fri., May 7: 7:30 – 10:00 am, Room 204
- Extra Exam: Same session as Exam #3

E) Additional Course Information

Attendance: You are expected and encouraged to attend all lectures and labs. You are responsible (even if you miss a lecture or lab) for all announcements, course changes, and course materials that are mentioned or discussed in classes and labs.

Cheating: Academic dishonesty is not tolerated at Texas Tech University. Cheating in any form will be treated according to the rules enumerated in the TTU Student Handbook.

Help Resources: If you’re having problems with understanding the course materials, please visit the instructor during office hours.

Study Suggestions: A large amount of material is covered in this course. Study your lecture notes and read corresponding sections of the textbook and handouts. Begin studying for exams early on, and do not wait until the last minute to get help.

Civility in the Classroom: Students are expected to assist in maintaining a classroom environment that is conducive to learning. Polite behavior is expected. Out of respect for your fellow class members, please arrive on time and avoid interrupting class by turning off all cell phones and beepers.

Absence Due to Religious Observance: “Texas House Bill 256 requires institutions of higher education to excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day. The student shall also be excused for time necessary to travel. An institution may not penalize the student for the absence and allows for the student to take an exam or complete an assignment from which the student is excused.” Students missing an exam due to a recognized religious event must notify the instructor in advance of the event so that alternative arrangements can be made.
Absence Due to Officially Approved Trips: The Texas Tech Catalog states that a person responsible for a student missing class due to an official trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

Absence Due to Illness: Exams missed as a result of illness can normally only be written on a later date if appropriate documentation can be provided in a timely manner (e.g., a doctor’s note provided to the instructor through the Center for Campus Life). Students lacking university-recognized documentation normally take the optional comprehensive extra exam at the end of the semester (this exam is taken in the same exam session as Exam #3).

Exam Day Guidelines: Except for calculators, the use of electronic devices (e.g., cell phones, mp3 players) is not allowed during exams. Baseball type caps or other billed hats should be removed or turned such that the bill is in the back.

Special Arrangements: Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible so that accommodations can be made. Students typically must register with Student Disability Services.

F) Hardcopy and Electronic Resources

Selected materials related to lectures and readings will periodically be made available in hardcopy or in electronic format.

Electronic documents will be available at the TTU Blackboard website (just google “ttu blackboard” to find the site, or go directly to “www.blackboard.ttu.edu”).

Keep in mind that provided lecture summaries only highlight selected key topics, and must not be considered a replacement for class attendance or personal note taking.
2) Preliminary List of Lecture Topics

A preliminary list of lecture topics is provided below. The exact lecture topics covered in this course may differ from this list as a result of factors such as time constraints, and the order of lecture topics may change. Some lecture materials may be presented during lab sessions.

Regular lecture and lab attendance will allow students to keep up to date on the latest lecture timeline.

1 Introduction to Remote Sensing
   1.1 Introduction
   1.2 The Electromagnetic Spectrum
   1.3 Radiation Jargon
   1.4 Blackbody Radiation
   1.5 Radiation and the Conservation of Energy
   1.6 Reflection Geometry
   1.7 Atmospheric Windows

2 Spectral Response Curves for Geological Materials
   2.1 Introduction
   2.2 VIS to MIR Reflection Spectra
   2.3 Interaction of VIS to MIR Radiation with Minerals
   2.4 Vibrational Transitions in the TIR, and Their Influence on Thermal Emission
   2.5 The Spectra of Rocks in the VIS and IR

3 Human Vision and Color
   3.1 Introduction
   3.2 The Eye
   3.3 Color Systems

4 Aerial Photography
   4.1 Introduction
   4.2 History of Aerial Photography
   4.3 Basic Terminology and Concepts
   4.4 Aerial Photograph Scale
   4.5 Print Laydowns and Mosaics
   4.6 The Chemistry of B+W Aerial Photography
   4.7 Aerial Cameras
   4.8 Stereoscopics
   4.9 Measuring Distances and Elevations from Aerial Photographs
   4.10 Aerial Photograph Interpretation

5 Introduction to Digital Remote Sensing
   5.1 Introduction
   5.2 Sensors
   5.3 Platform Orbits
   5.4 Remote Sensing Satellites (VIS and IR)
   5.5 Remote Sensing Satellites (Microwave)
   5.6 Airborne Remote-Sensing Platforms (VIS and IR)
   5.7 Image Formats
6 Introduction to Digital Image Processing
   6.1 Introduction
   6.2 Computer Software for Viewing and Processing Imagery
   6.3 Image Display
   6.4 Image Query
   6.5 Image Georeferencing
   6.6 Radiometric Restoration, Image Filters, and Enhancement Techniques
   6.7 Image Classification
   6.8 Image Arithmetic

7 Digital Topographic Databases

8 A Survey of Major Planetary Remote Sensing Missions
   8.1 Introduction
   8.2 The Moon
   8.3 Mars
   8.4 Venus
   8.5 Other Inner Solar System Platforms
   8.6 The Outer Solar System
Spatial Data Analysis and Modeling in Geosciences

GEOL 4332

Hours (lectures): 4:00-5:00 p.m. TR, Science 203
(non-credit labs): 5:00-6:30 p.m. TR Science 203

Instructor: Seiichi Nagihara
Office: Science 314
Office Hours: 1:30-3:30 p.m. MW
Phone: 742-3149
Email: seichi.nagihara@ttu.edu

Course Description:

In this course, students will learn advanced techniques in GIS-based data interpretation, statistical analyses, and geospatial modeling. It is designed for researchers and practitioners who deal with a large volume of geologic, atmospheric, and other environmental data sets. The fundamental theories behind the analytical and modeling techniques are covered in detail. The theoretical knowledge will be enforced by a series of computer exercises, using real geological and environmental data. ArcGIS (Environmental Systems Research Institute, Inc.), Google Earth (Google, Inc.), and Geographix (Landmark Graphics Corporation) will be the primary GIS software tools for the exercises. We will also use Microsoft Excel for exercises in statistics.

Prerequisite: GEOL 3428/5428 or GEOG 3300/5300, and Statistical Methods (MATH 2300) or equivalent

Textbook: Introduction to 3D Data, H. Kennedy, John Wiley & Sons, 2009 (required)


Grading:

Students will be graded on their performances in in-class computer exercises and 3 sets of homework assignments. Every week, the instructor will check if students have complete the lab exercises from the previous week. Each homework assignment must be turned in by the prescribed deadline. Each homework assignment consists of technical questions related to the course material covered and computer exercises.

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<tr>
<td>In-class lab exercises - cumulative</td>
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After successful completion of this course, each student is expected to be able to perform the following tasks without others' help:

1. To determine basic geospatial relationship (direction, distance, area size, elevation/altitude, volume etc.) of objects displayed in 3-D perspectives on computers.
2. To produce maps in 3-D perspectives on computers, if given necessary geospatial datasets.
3. To perform univariate and bivariate statistical analyses applied to geographically referenced data.
4. To understand the fundamental theories of spatial interpolation.
5. To perform surface interpolation of geographically reference data.
6. To perform model simulations on hydrologic processes.

Methods to Assess Those Outcomes

Four sets of homework assignments will be given. Individual questions/problems in the homework assignments are designed to measure at least one aspect of the expected learning outcomes. After each assignment is given, the instructor will evaluate how well the class has done on each expected learning outcome. Then, course materials related to the exam problems will be reviewed and enforced.

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<tr>
<td>1/19</td>
<td>Introduction to 3-D data types in <em>ArcGIS</em> (K-Ch. 1)</td>
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<td>Introduction</td>
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<td>Ordinary Kriging (IS-Ch. 12)</td>
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<td>4/6</td>
<td>Terrain Models &amp; Analyses, Pt. 2 (K-Ch. 8, 9)</td>
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<td>Terrain Models &amp; Analyses, Pt. 1 (K-Ch. 8, 9)</td>
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<td>4/8</td>
<td>Subsurface mapping with <em>GeoGraphix</em> HW#2 due</td>
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<td>4/15</td>
<td>Importing GIS databases and well databases, Pt. 1</td>
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<td>Building geologic cross sections, Pt. 2</td>
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<td>Building geologic cross sections, Pt. 1</td>
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<td>Subsurface Contour maps, Pt. 2</td>
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<td>Subsurface Contour maps, Pt. 1</td>
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Spatial Data Analysis and Modeling in Geosciences

GEOL 5342

Hours (lectures): 4:00-5:00 p.m. TR, Science 203
(non-credit labs): 5:00-6:30 p.m. TR Science 203

Instructor: Seiichi Nagihara
Office: Science 314
Office Hours: 1:30-3:30 p.m. MW
Phone: 742-3149
Email: seichi.nagihara@ttu.edu

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<td>1/21 Instructor away</td>
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<td>1/28 Introduction to 3-D visualization, Pt. 2 (K-Ch. 2)</td>
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<td>2/4 ArcGlobe (K-Ch. 4)</td>
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<td>2/16 Bivariate Statistics, Pt. 1 (IS-Ch. 3)</td>
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<td>2/25 Spatial Continuity, Pt. 1 (IS-Ch. 5-7)</td>
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<tr>
<td>3/9 Point Estimation, Pt. 2 (IS-Ch. 11, 12) HW #2 out</td>
<td>3/11 Ordinary Kriging (IS-Ch. 12)</td>
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<td>3/25 Raster Surface Models, Pt. 2 (K-Ch. 6)</td>
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<td>4/1 Terrain Models &amp; Analyses, Pt. 1 (K-Ch. 8, 9)</td>
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<td>4/13 Building a subsurface mapping project, HW #3 out</td>
<td>4/15 Importing GIS databases and well databases, Pt. 1</td>
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<td>4/20 Importing GIS databases and well databases, Pt. 2</td>
<td>4/22 Building geologic cross sections, Pt. 1</td>
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<td>4/27 Building geologic cross sections, Pt. 2</td>
<td>4/29 Subsurface Contour maps, Pt. 1</td>
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<td>5/4 Subsurface Contour maps, Pt. 2</td>
<td>HW#3 due May 7</td>
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GEOL 4362/5362 • Tectonics/Advanced Tectonics • Spring 2010

Discussion: MW 1-2:20 PM, SCI 201.
Web: http://www.depts.ttu.edu/gesc/Faculty-Staff/Yoshinobu-index.php
Office: SCI 231, Office hours Whenever the door is open and Grendel is asleep.

Professor: Aaron Yoshinobu
email: aaron.yoshinobu@ttu.edu

Course Description: This course will evaluate the plate tectonic paradigm in terms of its historical evolution and modern application to understanding Earth evolution. Focus will be placed on defining the geometric, kinematic, and dynamic framework of the three types of plate boundaries, existing problems with rigid plate theory, and the evidence for the plate tectonic approximation. Geometry, kinematics, and dynamics of tectonics on a sphere will be examined on extraterrestrial bodies. The class will be 50% lecture by the prof and selected students and 50% student/prof-led discussion on selected topics. Students will be expected to participate in class by presenting papers and leading dialogue on various themes presented in the class over the course of the semester.

Prerequisites: Physical Geology, Structural Geology, Petrology/Earth Materials, Geophysics, Calculus; or instructor consent.

Required Supplies: The following supplies MUST BE BROUGHT TO EVERY CLASS MEETING: Pencils, metric ruler, drawing compass, protractor, tracing paper (8.5" x 11"), graphing calculator with trigonometric functions, colored pencils, stapler, 3-ring binder.

Learning Objectives for Tectonics: The learning objectives for this course are tied to the major concepts in the discipline of tectonics. In each theme, students should be able to do the following:

- Nature of Tectonic Analysis - develop skills to distinguish observations from interpretations: generate complex models to evaluate hypotheses, analyze the components of kinematic and dynamic analysis, distinguish evidence for rigid versus non-rigid plate evolution, apply scientific methodologies to evaluate tectonic phenomena.
- Plate Boundary Systems - explain the relationships between topography and surface/internal Earth processes, evaluate the kinematics of the three plate boundary systems, analyze geological constraints for plate kinematics.
- Rates & Durations of Tectonic Processes - recognize variation in plate velocity and predict how this will affect the nature of plate boundary zones, evaluate rates of deformation using various geochronometers and displacement histories, understand time spans, geologic rates, durations, scales, and the relationship between episodic events and time integrated history, simultaneously evaluate temporal and spatial relations across many scales.
- Reciprocal Visualization Skills - develop and utilize 3-D visualization skills to understand geologic spatial relationships, predict the orientation and type of fault that predominates at each plate boundary.
- Tectonic Data Collection, Organization, and Analysis - acquire basic velocity information on plate movement, calculate plate velocities based on geochronometric and/or paleomagnetic data, constrain kinematic constraints for triple-junction and/or plate boundary migration through time, evaluate sedimentological, structural, and topographic data in the context of tectonic driven rock uplift, assess the quality of crustal scale cross section that depict plate boundary interactions.

Readings:

There are no required texts. Readings will be derived from various journal articles, Geodynamics, by Tocce and Shubert (2nd ed.). Plate Tectonics: How it works, by Cox and Hart. Tectonics, by Moores and Twist, and other books. Copies of all readings will be available for reading or copying in a box in the Geoscience Reading Room. In addition to readings, I will pass out numerous handouts and maps over the course of the semester.

Assessments & Assignments:
All of the assessments will be used in four ways:
1) to engage students;
2) to assess student learning after content delivery;
3) to evaluate whether or not learning objectives were met by comparing pre- and post-test results; and
4) to assign grades.

Assessment Types:
Tests (2 exams), 100 points each. Homework assignments, 20 points each.
Presentations, 50 points each, 2 to 4 per student. Plate Tectonic Presentations, 100 points.
Plate Tectonic Collaborative Paper, 100 points; peer reviews, 50 points.

You will be given prior warning of tests and due dates. However, you may not receive any warning for other assessments; therefore, it is imperative that you not miss a single class meeting. Assessments will be reasonable in length and expectation. All assessments will be derived from discussion and reading material.
Grading:
TTU Operating Policy states that an "A" is excellent work, "B" is good work, "C" is average work, "D" is inferior (but not necessarily passing degree requirements), and "F" is failing to meet degree requirements. Specific grading rubrics will be handed out with various Assessments.

General Grading Rubric.
If you follow the guidelines below, you should be able to submit your best possible work. However, there is no guarantee that you will be awarded an "A" even if you feel that you have followed every guideline.

"A" Quality Work:

"A" work is the type of work that one would feel comfortable submitting to a professional, peer-reviewed scientific journal (e.g., GSA Bulletin, AAPG Bulletin, Nature, etc.) or to the Senior Project Leader in a professional industrial environment. Therefore, "A" work should have the following attributes at a minimum:

- submitted as a completed assignment before the deadline for review by the professor. The assignment will then be returned to the student for revision and resubmittal by the deadline. Although the student turns in a completed assignment for review early, there is no guarantee that the student will achieve a higher grade.
- no spelling or grammatical errors and should be printed.
- is well-organized in terms of presentation and is written concisely and professionally.
- distinguishes observation from interpretation, is supported by appropriate illustrations and other types of evidence that are presented in a systematic order, provides a cohesive and well-supported discussion of interpretations, and develops specific geological, geophysical, experimental, numerical or some other type of tests and/or requirements of the interpretations.
- is appropriately referenced.
- contains NO plagiarism or un-referenced statements.

"B" Quality Work:

"B" Work - is completed and turned in on time and demonstrates student comprehension of the basic observational and/or experimental elements of the study and their implications to the interpretation. "B" work should have the following attributes at a minimum:

- no spelling or grammatical errors and should be printed.
- distinguishes observation from interpretation, is supported by appropriate illustrations and other types of evidence that are presented in a systematic order, provides a cohesive and well-supported discussion of interpretations, and develops specific tests and/or requirements of the interpretations.
- is appropriately referenced.
- contains NO plagiarism or un-referenced statements.
- "B" work generally differs from "A" work in that it does NOT develop a testable geological argument that takes the reader's understanding "to the next level". In other words, "A" work provides insight and a potentially new approach to some previously unsolved problem or experiment.

"C" Quality Work:

"C" Work - is completed and turned in on time and demonstrates student comprehension of the basic observational and/or experimental elements of the study and their implications to the interpretation. "C" work should have the following attributes at a minimum:

- no spelling or grammatical errors and should be printed.
- distinguishes observation from interpretation, is supported by appropriate illustrations and other types of evidence that are presented in a systematic order, provides a discussion of interpretations, and develops specific tests and/or requirements of the interpretations.
- is appropriately referenced.
- contains NO plagiarism or un-referenced statements.
- "C" work generally differs from "A" and "B" work in that it presents the minimum amount of information and synthesis for the reader to glean the relevant geological issues at hand. "C" work does NOT develop a testable geological argument that takes the reader's understanding "to the next level". In other words, "A" work provides insight and a potentially new approach to some previously unsolved problem or experiment.

"D" Quality Work:

"D" Work - may or may not be completed and turned in on time and demonstrates an inferior effort by the student to comprehend and synthesize the basic observational and/or experimental elements of the study and their implications to the interpretation. "D" work may not have the following attributes at a minimum:

- no spelling or grammatical errors and should be printed.
- distinguishes observation from interpretation, is supported by appropriate illustrations and other types of evidence that are presented in a systematic order, provides a cohesive and well-supported discussion of interpretations, and develops specific tests and/or requirements of the interpretations.
- is appropriately referenced.
- contains NO plagiarism or un-referenced statements.
All assignments are due at the beginning of class one week after they are assigned unless otherwise noted. LATE WORK WILL NOT BE ACCEPTED.

Absences and late assignments will not be excused unless the Professor is given prior notice (i.e., written note from Dr., excused absence from University Administrator, etc.). Late assignments will be docked one grade/day after the due date (e.g., a "B" paper if turned in one day late will be given a "C" grade). Students may be excused from class during recognized religious holidays. Those with learning disabilities or who require some special arrangements in lecture should see me ASAP. Proof of the particular disability or condition must be furnished. The P.A.S.S. office in West Hall is available for special testing or studying services and counseling.

TENTATIVE Tectonics 4362/5362 · Spring 2010 Content

Syllabus review, Introduction to Plate Tectonics

How did we get here? Pre-Plate Tectonic Ideas for Earth Evolution.

Sea Floor Spreading, Mid-Ocean Ridges, Ophiolites, & Harry Hess

Geometry & Kinematics of Plate Tectonics – WJ Morgan

Seismology + Arcs = Subduction Zones

Plate Boundaries in Detail – Transform Faults

Plate Boundaries in Detail – Riffs and Oceanic Spreading Centers

Plate Boundaries in Detail – Convergent Boundaries

- Subduction zones
- Collision belts
- Fold & thrust belts

Exhumation, Erosion, Extension, Denudation, Deformation,

Intraplate Deformation – Did Morgan have it all wrong?!?!?!?! Or, Does can GPS tell us more than which way to the closest Starbucks?

Hot Spots – Plumes – Bic Lighters

Tectonics is not unique to Earth. True or False.

Field trip to regions of active deformation and paleo collision...

Plus, a whole lotta surprises...

FINAL EXAMINATION MAY
INORGANIC GECHEMISTRY
GCH 5405 - Section 001
GEOL 4001
Fall 2009

Contact: moira.ridley@ttu.edu
Office: 324 Science Building
Office hours: Tuesday 1:30 – 2:30 p.m.

Course Location and Time: Science building, Room 205
Monday and Wednesday, 11:00 a.m. – 12:45 p.m.

Thermodynamics of Natural Systems, G. M. Anderson
Supplemental reading: Geochemistry, 2nd Ed., A.H. Brownlow

Course Description: The course will introduce students to the basic principles and fundamental concepts of inorganic geochemistry. The course will emphasize the usefulness and application of geochemistry in understanding, predicting and modeling the chemical reactions that occur in many geologic processes. The aim of the course is to provide students with the quantitative tools to solve geologic and environmental problems. Assigned problem sets are an integral part of the course, these exercises will provide practical and applied experience in working through and solving geochemical problems.

Expected Learning Outcomes: Upon completion of this course, students will:
1. Have a broad overview of the field of geochemistry and how it relates to other areas of the geosciences
2. Have an appreciation for the types of problems that geochemistry addresses
3. Have a fundamental understanding of chemical equilibrium, and the effects of pressure and temperature on chemical equilibrium
4. Be able to apply chemical principles and concepts, learnt in chemistry to geochemistry and geological problems
5. Be able to balance chemical reactions that occur commonly in weathering, igneous and metamorphic, and redox controlled environments
6. Have a basic understanding of applying radiogenic isotope geochemistry to geochronology
7. Gain the ability to solve quantitative geochemistry and environmental problems

Assessment of Learning Outcomes: Assessments of learning outcomes will be by weekly problem sets, a mid-semester and final exam.
1. Problem sets – will be assigned weekly, these will be designed such that students work through practical and applied geochemical problems relevant to the material covered in lectures. Problem sets will permit evaluation of students’ understanding of the topics covered.
2. Problem set recap – in each lecture period time will be set aside to address questions that have arisen while students work through problem sets. Again, this will allow for evaluating the students’ grasp of the geochemistry material, and will allow the instructor to modify lecture content accordingly.

3. Problem set review – each problem set will be reviewed in class, with class discussion. Class discussion of the material will be encouraged.

4. Mid-semester exam – following the mid-semester exam, it will be reviewed in class, with class discussion.

**Grading:** Grading will be based equally on students’ performance in exams and problem sets. There will be two *take-home* exams, and near-weekly problem sets (typically 10 to 12).

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<thead>
<tr>
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<th>Percentage</th>
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<tbody>
<tr>
<td>Mid semester exam</td>
<td>25%</td>
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<tr>
<td>Final exam – comprehensive</td>
<td>25%</td>
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<tr>
<td>Problem sets</td>
<td>50%</td>
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</table>

**Exam Schedule:**
- October 19: Mid-semester exam handed out
- October 26: Mid-semester exam due by **1:00 pm**
- December 7: Final exam handed out
- December 9: Last day of classes
- December 14: Final exam due by **10:00 a.m. - No Exceptions**

**Course Outline:**
- Introduction
- Atomic structure / Periodic Table / Bonding and crystal chemistry
- Thermodynamics
- Aqueous geochemistry
- Mineral Stability - Activity diagrams
- Redox chemistry
- Radiogenic isotope geochemistry / geochronology
- Stable isotope geochemistry

Any student who, because of a disability may require special arrangements in order to meet course requirements should contact the instructor as soon as possible to make any necessary accommodations.

All policies presented in *The Bulletin of Texas Tech* will be adhered to strictly.
FALL 2009
GEOGRAPHY 3300 / 5300
GEOGRAPHIC INFORMATION SYSTEMS

Dr. Kevin R. Mulligan
Office: 208 Holden Hall
Office Hours: MW 1:00 - 2:00 p.m. or by appointment.
Lab Instructors: Chris Van Nice, Ada Warren and Rachel Clark

Lecture: MW 12:00 - 12:50 p.m.
Phone: 742-2466 ext 243
Email: kevin.mulligan@ttu.edu

Course website: http://gis.ttu.edu/geog3300

Course Objective: Geographic information systems are computer systems designed to manage and analyze spatial data, where spatial data are any data that are tied to places or geographic coordinates. In this course we will develop a basic understanding of geographic information systems using ArcGIS, a very powerful and widely-used desktop GIS.

Learning Outcomes: After completing this course, students will be able to:
1) explain what a GIS is, how it works, and what it can do.
2) understand the basic principles of georeferencing (datums and coordinate systems),
3) understand how to manage, query and analyze spatial data - and create publication quality maps,
4) apply basic cartographic principles (e.g. map projections, symbology and layout design),
5) obtain GIS data from Internet sources and evaluate these data in the context of a given project.

Required Lab: You are required to enroll in one of the lab sections for either GEOG 3300 or GEOG 5300.


Required USB Flash Drive: To save your lab work, you need to purchase a USB flash drive early in the semester. Since GIS data can take up a lot of space, a 512 MB flash (or larger) is recommended.

Required Email: You are required to have a valid TTU email address for setting up your ESRI Global Account.

Assessment and Grading: There are two exams in this course (a midterm and a final), one lab quiz, one county basemap project and one final project. Each exam is worth 100 points and the lab quiz is worth 50 points. The county basemap project is worth 50 points and the final project is worth 100 points. Your final course grade is therefore based upon a possible total of 400 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Map Assignments: You are expected to complete each of the scheduled map assignments during the lab class time. Ten points will be deducted for each missed map assignment. Five points will be deducted for late map assignments.

ESRI Virtual Campus: You are also expected to complete the ESRI Virtual Campus course modules on time. Ten points will be deducted for each missed Virtual Campus assignment. Five points will be deducted for late assignments.

Exams and Lab Quiz: The exams will consist of a combination of true/false, multiple choice, and short answer questions that cover the lectures and reading assignments. The lab quiz is designed to assess you understanding of the ArcGIS software and the quiz will include a map assignment

Make-Up Exams: You are required to take the exams and quiz at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Class Attendance: Attendance will be taken in lecture on an intermittent basis. Attendance will be taken in lab every week. If you have any problems during the semester, please let us know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, November 2nd, 2009.

Disability Statement: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact me as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note that instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.
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<th>LECTURE</th>
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<th>LAB</th>
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<tbody>
<tr>
<td>AUG</td>
<td>31 Introduction (course logistics and brief intro to GIS)</td>
<td>1</td>
<td>Map Assignment 1</td>
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<tr>
<td></td>
<td>02 Feature types and data structures (vector vs raster data)</td>
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<td>ESRI VC 1 Getting Started</td>
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<td>SEP</td>
<td>07 Labor Day – no class</td>
<td>2</td>
<td>Map Assignment 2, Topographic Map Exercise</td>
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<td>09 Types of maps (map scale &amp; function – thematic maps)</td>
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<td>ESRI VC 2 Map Symbology</td>
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<td>14 Data classification (how to lie with maps)</td>
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<td>Map Assignment 3, Contour Line Exercise</td>
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<td>16 The geographic grid (latitude and longitude)</td>
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<td>ESRI VC 3 Georeferencing Data</td>
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<td>21 Map location and spatial reference (datums)</td>
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<td>Map Assignment 4, Lat-Long Exercise</td>
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<td>23 Map projections (getting the Earth onto a flat map)</td>
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<td>ESRI VC 4 Organizing Data</td>
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<td>28 Coordinate systems (UTM coordinate system)</td>
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<td>Map Assignment 5, UTM Exercise</td>
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<td></td>
<td>30 Coordinate systems (State Plane Coordinate System)</td>
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<td>ESRI VC 5 Creating Data</td>
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<td>OCT</td>
<td>05 Land division systems (public land surveys)</td>
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<td>Map Assignment 6, SPCS / PLSS Exercise</td>
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<td>07 Data sources (obtaining data in the public domain)</td>
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<td>ESRI VC 6 GIS Analysis</td>
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<td>12 Student Holiday – no class</td>
<td>7</td>
<td>County Basemap Data Acquisition (take home)</td>
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<td>14 Creating a county basemap (data acquisition handout)</td>
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<td>ESRI VC 7 Geoprocessing &amp; Models</td>
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<td>19 Effective map design (knowing the purpose of your map)</td>
<td>8</td>
<td>County Basemap Project (in lab)</td>
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<td>21 EXAM 1</td>
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<td>ESRI VC 8 Designing Maps with ArcGIS</td>
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<td>26 Creating data (digitizing and GPS)</td>
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<td>County Basemap Project (in lab)</td>
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<td></td>
<td>28 Creating data (field mapping with GPS)</td>
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<td>County Basemap Draft Due Friday Oct 30th</td>
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<tr>
<td>NOV</td>
<td>02 GIS analysis (intro to spatial modeling and map algebra)</td>
<td>10</td>
<td>LAB QUIZ (ESRI VC, topo maps and a map assignment)</td>
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<td>04 Buffalo Commons (final project description)</td>
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<td>ESRI VC, topo maps and a map assignment</td>
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<td>09 Building the spatial model (choosing variables)</td>
<td>11</td>
<td>Final Project 1, 2 (in lab)</td>
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<td>11 Enterprise applications of GIS (managing workflows)</td>
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<td>ESRI VC, topo maps and a map assignment</td>
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<td>16 Designing a GIS (database design and implementation)</td>
<td>12</td>
<td>Final Project 3, 4 (in lab)</td>
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<td>18 Metadata and accuracy (knowing the origins of data)</td>
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<td>County Basemap Final Due Friday Nov 20th</td>
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<td>23 Digital Imagery (airborne and satellite remote sensing)</td>
<td>13</td>
<td>Final Project 5, 6 (open lab Mon, Tues)</td>
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<td>25 Thanksgiving – no class</td>
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<td>Final Project 7, 8 (in lab)</td>
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<td>DEC</td>
<td>02 The Spatial Analyst extension (working with raster data)</td>
<td>14</td>
<td>Final Project (open lab Mon, Tue, Wed)</td>
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<td>07 The 3D Analyst extension (animations and fly-throughs)</td>
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<td>Final Project (open lab Mon, Tue, Wed)</td>
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<td></td>
<td>09 Virtual globes (ArcExplorer, Bing and Google Earth)</td>
<td>15</td>
<td>Final Project (open lab Mon, Tue, Wed)</td>
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<td>16 EXAM 2 - Wed, December 16, 1:30 – 4:00 p.m.</td>
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<td>FINAL PROJECT DUE at FINAL EXAM</td>
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Remote Sensing of the Environment  
GEOG 3301  Holden Hall 221  
Tuesday and Thursday 4 – 5:50 pm

Dr. Tina Delahunty  
Email: tina.delahunty@ttu.edu  
Office: Holden Hall 217  
Office Hours: 3-5 pm Wednesday

Description and Prerequisites  
Introduction to remote sensing techniques and digital satellite and aerial image processing. Emphasis on the use of remote sensing imagery in geographic information systems and land cover change analysis. Geographic Information Systems (GEOG 3300) or equivalent. Physical Geography or Earth Science a plus. Computer literacy a must.

Expected Learning Outcomes/Cognitive Objectives  
Specifically, upon completion of this course, students shall be able to:

1) Understand the sub-discipline’s relationship to major geographic principles
2) Describe and discuss common uses of raster imagery and be aware of the breadth of disciplines that use remote sensing as a tool to monitor phenomena on the Earth
3) Understand the basics of the acquisition of moderate and high resolution raster data
4) Understand what the raw pixel data of an image represents on the Earth’s surface and the concepts behind viewing imagery in different band combinations
5) Locate, download, and manipulate free moderate and high resolution imagery from the Global Land Cover Facility, EROS, TNRIS, Seamless USGS, and a county or state organization
6) Perform advanced image manipulation in ERDAS: a) Interpret raw data in terms of ERDAS pixel data, histograms, and raster attribute options, b) Enhance imagery via contrast stretching and atmospheric correction, c) Perform unsupervised and supervised classification, d) Mask unwanted features from imagery, e) Clip imagery to political or other polygon boundaries, f) Quantify landscape change using image classification and recode techniques, and g) Perform accuracy assessment of classified imagery
7) Successfully rectify imagery in ArcGIS and define and reproject raster imagery in ERDAS and ArcGIS
8) Successfully import/export various raster image file types
9) Create map documents in ERDAS and ArcGIS
10) Communicate in remote sensing terminology
11) Be painfully aware of software and data compatibility issues
Methods of Assessment and Grading
Learning Outcomes will be assessed by the following methods:
Objective testing (multiple choice, true-false, and fill in the blank questionnaires), Classroom assessment (completion of, and performance on, laboratory assignments), and Individual reflection (free writing quizzes and creation and presentation of PowerPoints). Each module of objective testing, classroom assessment and individual reflection is worth 10 points. At the end of the semester all points are totaled and averaged. Be aware that some 10 point assignments are easy and some are difficult. There will be no make-up assignments. If you do not attend a class you will receive a zero for the assignment(s) done or due on that day. If an assignment is done, but not printed out in time or not put in it's correct folder on time, no points are given. No points are given for late assignments. One 10-pointer is dropped for each student at the end of the semester. Help points may be added to your total point summary. Grades can always be determined by averaging grades of completed assignments. 100% attendance is expected. Attendance is taken at the beginning of each class period. Grade distribution is based on standard 90% and above A, 80% and above B, etc. Performance on the assignments act as evidence that you are making progress in the course and that you are achieving the expected learning outcomes.

Textbook References (no purchase required)

Academic Integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.
Civility in the Classroom - “Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction.”

Observance of Holy Days: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.
Students with Disabilities: Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor at tina.delahunty@ttu.edu or Holden Hall 217 as soon as possible to request necessary accommodations. Students should present appropriate verification from Student Disability Services (AccessTECH).
Remote Sensing of the Environment  
GEOG 5301  Holden Hall 221  
Tuesday and Thursday 4 – 5:50 pm

Dr. Tina Delahunty  
Email: tina.delahunty@ttu.edu  
Office: Holden Hall 217  
Office Hours: 3-5 pm Wednesday

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Textbook References (no purchase required)

Academic integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.
Civility in the Classroom - “Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction.”

Observance of Holy Days: “Religious holy day” means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.
Students with Disabilities: Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor at tina.delahunty@ttu.edu or Holden Hall 217 as soon as possible to request necessary accommodations. Students should present appropriate verification from Student Disability Services (AccessTECH).
Research is formalized curiosity. It is poking and prying with a purpose. – Zora Neal Hurston

Geography 3340 / 5340: Introduction to Research in Human Geography
Fall Semester 2013

Instructor: Perry Carter
Office: 210 Holden Hall
Phone: 742-2466 ext. 251
E-Mail: perry.carter@ttu.edu
Office Hours: Tuesday 1:30-3:30
or by appointment

Class Location: Holden Hall 284
Days: Tuesday
Time: 6:00-9:00 PM

COURSE DESCRIPTION
The function of this course is to provide students with a comprehensive overview of the central components involved in developing a geographic research project. This will include exploring how a topic is selected, relevant literature for developing a project idea, the range of methods that can be utilized, and the production of a research proposal. Additionally, the course will give students an appreciation of and facility with the kinds of research methodologies and techniques employed by human geographers. The goal of the course is for students to develop an understanding of basic concepts, issues, and procedures involved in conducting research. Examples of the methodological issues that will be covered in this class include: questionnaire design, secondary data sources, reviews of literature, descriptive statistics, Geographic Information Systems (GIS), the interviewing process, library research, the use of spreadsheets, descriptive and inferential statistical analysis, data processing, and participant observation. The primary objective of this course is to provide students with the necessary skills to conduct independent research. The student will find that the skills they acquire in this course will be invaluable later in their careers in the private sector, the public sector, or in academia.

Course Purpose Statement
This course satisfies the Geography program’s research course requirement for majors

Americans with Disabilities Act
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for person with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you require special arrangements in order to meet course requirements, you should contact the instructor as soon as possible to make necessary accommodations. Students should present appropriate verification from Disabled Student Services, Dean of Students office.

Accommodation:
Accommodation will be provided for students that have a disability documented through Access Tech (Disabled Student Services). Accommodations are designed to enable students with disabilities to perform on an equal basis with their peers. If you have been recommended for an accommodation, you should take advantage of this leveling opportunity by contacting the professor early in the semester. Any exams taken without notifying the professor of a disability will stand as recorded. Access Tech is located at 247 West Hall (806) 742-2405. Accommodation can apply to permanent disabilities or to temporary injuries as well (broken arms, surgery, etc.) If you need any special accommodation, please see the instructor during the first week of classes.
Expected Learning Outcomes

Students who complete this course should be able to:

1. Appreciate and understand the breadth of social research in Geography.
2. Analyze and evaluate social and cultural geographic research.
3. Apply research design frameworks to answer a broad range of questions.
4. Apply quantitative and qualitative research analysis tools to various research problems.
5. Apply computer technologies to various research problems.
6. Create a research proposal.

Methods for assessing the Expected Learning Outcomes:

Outcome 1 — Class discussion of geography research journal articles
Outcome 2 — Annotated bibliographies over geography research journal articles
Outcome 3 — Research proposal evaluation exercise
Outcome 4 — Weekly lab assignments, oral history coding project, and the final examination
Outcome 5 — Weekly lab assignments
Outcome 6 — Writing a research proposal based on the student’s interests

To be conscious that you are ignorant is a great step to knowledge. – Benjamin Disraeli

Common sense is the collection of prejudices acquired by age eighteen. – Albert Einstein

Grading

Points are accumulated in this class based on your performance on the assessment activities outlined above. I expect you to take each one of these activities very seriously and to come to me if you are having problems or if you have any questions.

Grade Scale:

A 100 - 90 Exceptional performance
B 89 - 80 Satisfactory performance
C 79 - 70 In need of improvement
D 69 - 60 Unsatisfactory
F Less than 60 Unacceptable
Course Materials:

The fact that an opinion has been widely held is no evidence whatever that it is not utterly absurd.
- Bertrand Russell

Required:

The Essential Guide to Doing Your Research Project by Zina O'Leary

Field Work for Human Geography by Richard Phillips & Jennifer Johns

Statistics and Data Analysis for Social Science by Eric Krieg

Academic Honesty

Texas Tech’s policy on academic and scholastic honesty states:

"It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension."

To be exact plagiarism includes presenting another person’s words, ideas, or designs as your own without giving them appropriate credit. Anyone found to be guilty of plagiarism will receive a zero (0) on their plagiarized assignment. If you do have questions about how to research or reference sources, please let me know.
Course Requirements:

1) Beginning September 24th students will turn in a Reaction Paper over the past week’s journal readings. There will be 6 Reaction Papers each accounting for 4 points (a total of 24 points). See the last two pages of this syllabus for journal readings and Reaction Paper guidelines.

2) You are to pick a research topic of interest to you and write three research questions. Research questions define what you are researching and provide a blueprint (guide) for your research project. Examples of research questions:

- Does geographical location and land use directly influenced distributions of property crime offenses?
- To what extent does a car dealership’s location near competing car dealers affects its sales performance?
- How did the segregation of free people of color and the geographic distribution of the institution of plâcage (legally sanctioned “mistress” relationships between white men and free women of color) marker of the changing construction of race in New Orleans from 1803 to 1850?
- How has rural Central Kentucky formed as a new destination for Latinos? In other words, do Latinos come straight from their sending countries, or do they come from other established immigrant cities and gateways within the United States such as the urban South?
- What are the primary reasons for farmers leaving farming in Florida?
- Are students living in rural areas more likely to be at a disadvantage academically in terms of their lack of school choices?
- Is hurricane intensity a good predictor of total economic loss when hurricanes landfall?
- Are all communities in the Jacksonville, Florida urban region within a reasonable distance to a hospital? If not, what are the communities that are farther away from a hospital?

Your research questions in themselves counts for nothing, but without them I will not accept your research proposal (due November 5th).

3) The research proposal: A proposal is a plan for studying your topic. It is a plan that [1] describes what you are studying, [2] evaluates what others who have studied this topic, or similar topics, found in their research, [3] describes the information (data) that you will need to study your topic, [4] describes how you will find or gather this information (data), [5] describes how you will turn this information (data) in to evidence to answers your research question(s) — i.e., how you will analyze your data.

Your proposals must be no less than six (6) pages long and no more than eight (8) pages. Research proposals must include a review of literature of your topic with at least five (5) peer reviewed articles and/or book chapters. Details about the proposal will be given later in the class.

The proposal will account for 18 points of your final grade (due December 9).
4a) Before each class there will be a quiz over last week's lecture and the week's readings. There will be nine (9) quizzes but only your eight (8) best quizzes will count, the lowest will be dropped. Each quiz will be worth six (6) points toward your final grade (for a total of 48 points).

- OR -

4b) There will be a final exam over everything that has been cover in this course. This exam is worth 48 points toward your final grade. If you are satisfied with your performance on the weekly quizzes up to this point then you may choose not to take the exam. If you are not satisfied with your performance on these quizzes then you can take the final exam and whichever point total is higher, points from quizzes or point from final exam, will be used toward your final grade while the other will be dropped.

6) On November 6th I will hand out research proposals written by students at other universities who had entered a student proposal writing contest (where I was one of the judges). You are to read and evaluate these proposals and decide which ones should be funded (given money to carry out the research proposed). You are to rank these proposals and write up a brief rationale (1/2 a page) for why you ranked the proposal the way you did. Due in class on November 12 (worth 10 points).

7) **Graduate Students:** I will expect you to do the same work as the undergraduate students, but I will expect you to do it better — i.e., you will not be graded like an undergrad.

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**Grading:**

- **Quizzes:**
  - Best 8 out of 9, worth 6 points each: 48 points
- **Final Exam:**
  - 48 points
- **Reaction papers:**
  - 6 worth 4 points each: 24 points
- **Proposal Evaluation:**
  - 10 points
- **Research Proposal:**
  - 18 points
- **Total:**
  - 100 points
A man who chooses not to read is just as ignorant as a man who cannot read. – Mark Twain

**SCHEDULE** (subject to change at instructor’s discretion):

**Date** | **Book Readings (pages)** | **Reaction Papers** | **Quizzes** | **Other**
---|---|---|---|---
9-3 | O’Leary 1-3 | | 1 |  
9-10 | O’Leary 4, Krieg 1 | | 2 |  
9-17 | O’Leary 5, Phillips 1 | | 3 |  
9-24 | O’Leary 6, Phillips 2, Krieg 3 | 1 | 4 |  
10-1 | O’Leary 7, Phillips 3, Krieg 4 | 2 | 5 |  
10-8 | Phillips 4, Krieg 5 | 3 | 6 |  
10-15 | Phillips 5, Krieg 6 | 4 | 7 |  
10-22 | Phillips 6, Krieg 7 | | |  
10-29 | Phillips 7, Krieg 8 | 5 | 8 |  
11-5 | Phillips 8, Krieg 10 | 6 | 9 | Questions Due
11-12 | | | | Handout proposals
11-19 | | | | Proposal Evaluation
11-26 | No Class | | | Final Exam
12-3 | No Class | | |  
12-9 | Monday; my office (210) | | | Research Proposal Due before 5:00 PM

*Reading without reflecting is like eating without digesting – Edmund Burke*
Too often we hold fast to the clichés of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought. – John F. Kennedy

Journal Readings for Annotated Bibliography Assignments: Starts September 24th

These articles can be found by going to: muse.jhu.edu/journals/sgol and then

**September 24**


**October 1**

2- “Where can I Build my Student Housing?”: The Politics of Studentification in Athens-Clarke County, Georgia, Pickren, *Southeastern Geographer*, Volume 52, Number 2, Summer 2012, pp. 113-130

**October 8**

3- Gasoline Station Morphology on Virginia’s Eastern Shore, Macpherson & de Socio, *Southeastern Geographer*, Volume 53, Number 1, Spring 2013

**October 15**

4- Rehabilitating the Region: The New Deal, Gender, and the Remaking of the Rural South Coleman, *Southeastern Geographer*, Volume 50, Number 2, Summer 2010, pp. 200-217

**October 22**


**October 29**

6- Hurricane Katrina as a Lens for Assessing Socio-Spatial Change in New Orleans Watkins and Hagelman III, *Southeastern Geographer*, Volume 51, Number 1, Spring 2011, pp. 110-132

We see things not as they are but as we are. – Anaïs Nin
Guideline for a good Reaction Paper (starts Sept. 24th)

1. Read the given article carefully and think about what you are reading.

2. Write the title of the article, the authors, the name of the journal, and other source information. Example:

   "They are just like the Rest of us, only with a Bigger House: Spatial Integration of Socio-Economic Class in Rural Mingo County, West Virginia," by Leonard, Southeastern Geographer, 2009, Vol. 49, no. 3, pp. 267-220

3. Identify the research statement (where the researcher(s) tell the reader what the research is about). Quote it in your paper (it is usually just a sentence or two) and give the page number where it is found.

4. Describe the data used in the paper and how it was gathered or where it came from.

5. Describe how the researcher(s) analyzed her/his/their data — turn it into evidence to support the point(s) they are making. Common examples are the use of repeating themes (patterns) from interviews or written documents, patterns found using statistical or data analysis methods, patterns found by mapping data.

6. Summarize the findings of the article in a paragraph of no more than 100 words.

7. Limit your writing to 300 to 350 words. I will not read a paper less than 300 words. Just as a guide, this page has 250 words on it. If it were a reaction paper it would need 50 more words.

8. The paper should be single-space in 12pt Times Roman font.

9. Even though I am often guilty of not doing so, please proofread your reaction papers carefully to avoid any grammatical mistakes or typos.

This is a reading and thinking project.
Geography 3356 Geography of Texas and the Southwest Fall 2012
Linda Jones
Office Hours: M 9-10, W 1-2 (if my door is open-you are welcome)
Office Phone: 742-2466 ext. 245
Email: linda.jones@ttu.edu

Materials
Southwest: Three Peoples in Geographic Change 1600-1970 by D.W. Meinig
The Devil's Highway by Luis Urrea
What Wildness Is This by Susan Albert
A novel of the student's choice (from a list provided by the instructor)

Articles assigned by the instructor

Learning Outcomes
Students should be able to:

1. Delineate and describe the region and sub-regions.

2. Explain the various cultures and subcultures of the region and the tensions between them.

3. Explain the concepts of place and space within the context of the region

4. Analyse the political and economic structure unique to the region

5. Critically analyse environmental issues within the region

6. Discuss the possible futures of the region

7. Interpret maps to gain information in order to explain features and issues unique to the region.

Assessments

1. Major component assessed on first exam essay questions.

2. Each exam and a major focus of each of two research projects

3. In class discussion and each of three exams

4. In class discussion and each of three exams.

5. In class discussion and each of three exams.

6. In class discussions, exams and a major component of research projects

7. This is a part of each of three exams and each of two research projects.

Attendance

Class attendance is expected and has a strong correlation with a good grade. You are responsible for all material covered in class, including videos. Since exams are take-home essays there will be no late exams allowed. If you are ill on the day that the exam is due, you will need to email it to me.

Don’t schedule medical appointments during class time. I recommend that you exchange emails, phone numbers & good calling times with 2 or 3 classmates in case of absence.

Tardiness: Arrive to class on time. Avoid entering class late; it causes a distraction and is inconsiderate to your professor and classmates.
If your professor does not let you out of your previous class on time, let me know and I’ll be glad to contact him/her. Being late during the semester will affect your grade in this class.

**Absences due to religious observance:** A student may be excused from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose.

**Absence due to officially approved trips:** The Bulletin of Texas Tech states that the person responsible for a student missing class due to a trip should notify the instructors of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

**Grading**

Grades will be posted on Elearning on your MyTech web site. Your grade in this course is based on 3 exams (each worth 100 points), 1 book essay (worth 50 points) and 1 group assignment (worth 50 points). Your grade will be based on your cumulative average.

**Exams** will be take home essay exams. Each will require correct citations. The exams are not cumulative. There is no final exam. Your grade will be based on your cumulative average.

The **book essay** will be based on a novel selected by the student and will focus on how the author used the landscape (cultural and/or physical as a character or to inform the plot. This will should be 4-5 pages with citations from the novel.

The **group assignment** will center on a cultural or human geography topic. Each group will give a 15 minute presentation and each person will turn in a short paper 3-5 pages outlining their part of the project with citations.

**Academic Honesty:** It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. Complete honesty is required of students in the preparation and presentations of any and all phases of course work, as their own. This applies to quizzes of whatever length as well as to final examinations or any other homework or completed assignment. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. “Scholastic dishonesty” includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act. **All sources must be cited!!! If you cut and pasted then you used work that was not original to you and you must cite it!!!**

**Civility in the Classroom:** Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor; students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class. Examples of inappropriate behavior include cellular
phones and beepers, hostile or excessively aggressive behavior towards other students or the instructor, excessive tardiness, leaving class early, making offensive remarks, prolonged chattering, reading newspapers during class, sleeping, talking out of turn, arriving late to class, dominating discussions, overt inattentiveness, etc.

**Students With Disabilities:** Any student who, because of a disability, may require special arrangements in order to meet course requirement should contact the instructor as soon as possible to make any necessary accommodations. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. Disability status is confidential and should be discussed in private with the instructor once you have completed the appropriate Student Disability Services verification procedures.

**Student Use of Personal Technology:** Cell phones, pagers and other devices that might ring or otherwise introduce a distraction must be turned off. The making or receiving of phone calls during class is prohibited (except in the cases of emergency). **Students must leave the classroom if this requirement is disregarded.** The use of a notebook computer or similar electronic or digital device, for any purpose, including note taking, is subject to the approval of the instructor. No personal electronic device should ever be utilized during quizzes, examinations, or any testing or assessment situation unless specifically authorized by the instructor. **Utilizing a personal technology device during class can result in a zero grade for participation, and any usage or attempted usage during any type of testing will result in a failing grade for that test.**

**Calendar**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>Aug. 27-31</td>
<td>Definition of region</td>
<td>Meinig pgs. 3-8</td>
</tr>
<tr>
<td>Sept. 3</td>
<td>Labor Day-no class</td>
<td></td>
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<tr>
<td>Sept. 5-7</td>
<td>Physical characteristics</td>
<td>Article #1, Albert pgs. 219-260</td>
</tr>
<tr>
<td>Sept. 10-14</td>
<td>Water</td>
<td>Article #2 Albert pgs. 37-88</td>
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<tr>
<td>Sept. 17-21</td>
<td>Climate</td>
<td>Article #3 Albert pgs. 127-162</td>
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<tr>
<td>Sept. 24</td>
<td>Exam #1 due</td>
<td>Meinig pgs. 9-53</td>
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<tr>
<td>Sept. 24-28</td>
<td>Cultural History</td>
<td>Meinig pgs. 9-53</td>
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<tr>
<td>Oct. 1-5</td>
<td>Sense of Place</td>
<td>Meinig pgs. 263-298, Wilkinson</td>
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<tr>
<td>Oct. 8</td>
<td><strong>Book essay due</strong></td>
<td>Meinig pgs. 54-65</td>
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<tr>
<td>Oct. 8-12</td>
<td>Cultural Forces</td>
<td>Meinig 66-81</td>
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<tr>
<td>Oct. 15-19</td>
<td>Economic Forces</td>
<td>Meinig 82-119, Albert pgs. 89-126</td>
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<tr>
<td>Oct. 22-26</td>
<td>Urban Forces</td>
<td>Meinig 120-134</td>
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<tr>
<td>Oct. 29</td>
<td>Exam #2 due</td>
<td>Article #4</td>
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<tr>
<td>Oct. 29-Nov.2</td>
<td>Sub-regions</td>
<td>Urrea pgs. 4-114</td>
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<tr>
<td>Nov. 5-9</td>
<td>Sub-regions</td>
<td>Urrea pgs. 115-220</td>
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<tr>
<td>Nov. 12-16</td>
<td>Immigration</td>
<td>Meinig 120-134</td>
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<td>Nov. 19</td>
<td>Power</td>
<td>Article #5, Albert pgs. 163-186</td>
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<tr>
<td>Nov. 21-23</td>
<td>Thanksgiving-No Class</td>
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<tr>
<td>Nov. 26-30</td>
<td>Future of the region</td>
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<tr>
<td>Dec. 3</td>
<td>Exam #3 due</td>
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<tr>
<td>Dec. 3-5</td>
<td>Group Presentations</td>
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GEOGRAPHY 3353
MAN, RESOURCES, AND ENVIRONMENT

BOOK REVIEW INSTRUCTIONS:

Each student will be responsible for reading and writing a critical review of some book dealing with a topic relevant to this course, which because of its broad nature gives you a great deal of leeway. A vast number of books which pertain to specific topics covered in the course and/or textbook are available in the University Library and Lubbock Public Library so that each of you should have no difficulty in selecting a book on a topic of particular interest to you. A quick search through the Library online card catalog, an electronic database such as WorldCat or Geobase under First Search, the subjects listed on the syllabus, the assigned chapters of the text, the list of references for the chapters at the end of the text, or Amazon.com on the Internet should enable you to find a reasonably current book on a subject to your liking.

I would like for each of you to have selected your book for review by the class meeting on Friday, October 1, 2010. Graduate students are expected to choose and critically review two (2) books, which don’t necessarily have to be on the same general topic. The book(s) you choose for review must have my approval.

The book review(s) should be about seven (7) to ten (10) pages in length, typewritten, double-spaced, and with pages numbered. A cover page is not needed. The top of the first page should have a heading in the style of the following example:

GEOGRAPHY 3353
MAN, RESOURCES, AND ENVIRONMENT
Fall Semester, 2010

A Critical Book Review by
Billy Bob Boop


(This heading is then followed by your written critical review of the book).

The book review must be critical in nature and go beyond simply summarizing the contents of the book(s) selected, though you do need to summarize sufficiently to show me that you have read the entire book. As you read the book and prepare the review, you should keep the following questions in mind:

1. How is the book related to environmental science or to the content of this course?
2. In what way, if any, is the study geographic in nature?
3. To what extent does the author recognize the interrelatedness of most aspects of the physical and human environments?
4. Does the theme of the book consist of information you have read or already know on the subject?
5. How does the information you read agree or disagree with other information you have read or know on the subject?
6. What are the author's scholarly qualifications to write on this subject?
7. How authoritatively does the author support his/her views (by persuasive argument, thorough documentation, etc.)?
8. Is the subject of the book controversial?
9. Does the theme of the book consist of an objective treatment of the information, or is it a polemic representing only a single view?
10. Was the book pleasant and entertaining to read?
11. Would you like to read other material written by the same author or other books on the same topic?
12. Has reading the book given you any new insights or changed your opinion on any topic?
13. Has reading the book been a valuable learning experience? If not, you have made a very poor choice of books.

The completed critical book review(s) will be due at the class meeting on Monday, November 29, 2010. No late book reviews will be accepted. I expect to keep a copy of the review. Thus, if you wish to have the graded copy of your book review returned, please provide me with two (2) copies.

IMPORTANT DATES DURING THE FALL SEMESTER, 2010:

Aug. 31 Last day to add a course on the Web.

Sept. 6 LABOR DAY, University holiday.

Sept. 13 Last day to drop a course on the Web, or drop and get a refund.

Oct. 1 Must have selected book(s) for critical review.

Oct. 11-12 FALL BREAK, Student holiday.

Nov. 1 Last day to drop a course and receive an automatic W. Last day to declare pass-fail intentions.

Nov. 22 Last day to transfer between colleges.

Nov. 24-28 THANKSGIVING, University holidays.

Nov. 29 Completed book review(s) for GEOG 3353 due at class meeting.

Dec. 3 Last day to withdraw from the University.

Dec. 10 FINAL EXAM (7:30 am-10:00 am).
# GEOGRAPHY 3353

**MAN, RESOURCES, AND ENVIRONMENT**

Fall Semester, 2010; 9:00-9:50 MWF; Room 225, Holden Hall

Instructor: **Dr. Otis W. Templer**  
Office - Room 218, Holden Hall; Phone (742-3838); E-mail: otis.templer@ttu.edu  
Office Hours - 10:00-11:00 MWF or by appointment *(or whenever the door is open)*


<table>
<thead>
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<th>Month</th>
<th>Date</th>
<th>Text Assignment</th>
<th>Lecture/Discussion Topic</th>
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<td>August</td>
<td>27</td>
<td>Chaps. 1, 2, 6, 7</td>
<td>Introduction</td>
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<td></td>
<td>30</td>
<td>Understanding Our Environment</td>
<td>Population Geography and Population Problems</td>
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<tr>
<td>September</td>
<td>1</td>
<td>Frameworks for Understanding:</td>
<td>Population Biology</td>
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<td>3</td>
<td>Science, Systems and Ethics</td>
<td>Numbers and Distribution</td>
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<td>8</td>
<td>Population Biology</td>
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<td></td>
<td>10</td>
<td>Human Populations</td>
<td>Limitations of Severe Environments</td>
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<td></td>
<td>13</td>
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<td>on Population Distribution</td>
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<td></td>
<td>15</td>
<td>Chaps. 3, 4, 5</td>
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<td></td>
<td>17</td>
<td>Ecosystem and Ecology Review</td>
<td>Population Growth &amp; Consequences</td>
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<td>20</td>
<td>(Optional Readings)</td>
<td>Redistribution of Population</td>
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<td>22</td>
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<td>Controlling Population Growth</td>
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<td>Famine, Disease, etc.</td>
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<td>29</td>
<td></td>
<td>Population Policy</td>
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<tr>
<td>October</td>
<td>1</td>
<td><strong>EXAM NO. 1 (100 pts.)</strong></td>
<td>Global Food Resources and Problems</td>
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<td>4</td>
<td>Chaps. 8, 9, 10, 20</td>
<td>Diet and Nutrition</td>
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<td>Environmental Health and</td>
<td>Food Production and Agricultural Land</td>
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<td>Toxicology</td>
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<td>Food and Agriculture</td>
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<td>Pest Control</td>
<td>The Green Revolutions</td>
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<td>Sustainable Energy</td>
<td>Food from the Sea, Novel Sources</td>
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<td>Managing Water Resources</td>
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<td>5</td>
<td>Chaps. 15, 16, 17, 18, 21</td>
<td>Technology and Water Development</td>
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<td>8</td>
<td>Air, Weather, Climate (pp. 334-344)</td>
<td>Water Management Institutions</td>
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<td>10</td>
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<td>Mankind's Impact on Environment</td>
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<td>Air Pollution</td>
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<td>Water Use and Management</td>
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<td>Water Pollution</td>
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<td>Solid, Toxic, and Hazardous Waste</td>
<td>Other Environmental Impacts</td>
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<td>December</td>
<td>1</td>
<td>Entl. Policy, Law, and Planning</td>
<td>Legal and Political Aspects of Environmental Quality Control</td>
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<td>3</td>
<td>What Then Shall We Do?</td>
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<td>10</td>
<td><strong>FINAL EXAM (100 pts.) (7:30 a.m.-10:00 a.m.)</strong></td>
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COURSE OBJECTIVES, GRADING AND ATTENDANCE POLICY:

GEOG 3353, Man, Resources, and Environment, involves study of the interrelated problems of: 1) human population growth, 2) efficient management of natural resources, and 3) human disruption of the earth’s natural environment. It focuses on various technological solutions to these problems and their limitations. This course will enhance your ability to conceptualize the earth’s increasingly pervasive environmental problems and also enable you to more accurately analyze and evaluate possible solutions to these problems.

GEOG 3353 can be used to satisfy three (3) credit hours from the Physical Geography/GIS course block requirement for majors, and as a suitable upper-division course for minors. In addition, GEOG 3353 is an approved course in the Environmental Studies minor program and the Community and Urban Studies minor program. It can also be used to partially fulfill the Natural Science requirement (Arts and Sciences) and/or Technology and Applied Science requirement (General Education curriculum).

Your course grade will be determined primarily by your performance on three (3) examinations (100 pts. each) and a critical book review (60 pts.). Thus, you can earn a possible 360 points in this course. Letter and numerical grades for each examination are as follows: A=87-100; B=77-86; C=67-76; D=57-66; F=<57. The final examination is non-comprehensive, covering only the lecture and assigned text readings following Exam No. 2. Graduating seniors who fulfill certain conditions (separate handout) may elect to exempt the final examination. Letter and numerical grades for the required book review are as follows: A=54-60; B=48-53; C=42-47; D=36-41; F=<36.

It is doubtful that any Geography majors will need to take this course for Writing Intensive (WI) credit, but if so you will not be expected to do a book review. Instead, you will receive separate instructions for three (3) WI assignments, two (2) very short papers (25 pts. each) and one longer paper (50 pts.) spaced at intervals through the semester. Therefore, WI students can earn a possible 100 points for the three papers, and a possible 400 points in the course. Letter and numerical grades for WI credit are as follows: A=90-100; B=80-89; C=70-79; D=60-69; F=<60.

In this course, a majority of the examination questions will be taken from material covered in lecture so regular attendance is very important. During my lengthy tenure at Texas Tech, I never graded for attendance in my upper-division classes until recently, assuming that more mature students have finally realized the very high correlation between good grades and good class attendance in most courses. In recent years, however, poor attendance by a few students resulted in very bad grades that, in turn, significantly lowered the class average. Therefore, I have instituted this attendance policy. Students who have more than six (6) unexcused absences will have their final course grade lowered one full letter. For every six (6) additional unexcused absences after that, the final course grade will be lowered another full letter. Attendance will be taken on a roll sheet circulated at each class meeting, so please sign the roll each time you are present, and make sure you let me know of any excused absences. Occasional short pop quizzes can result in points to be added to your grade at the end of the semester and should be a further incentive to encourage regular class attendance.

Americans with Disabilities Act:

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.
Student Absence for Observation of Religious Holy Days:

A student who is absent from classes for the observation of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence if, no later than the fifteenth day after the first day of the semester, the student had notified the instructor of each scheduled class that the student would be absent for a religious holy day.
GEOG 4357: Geography of Arid Lands  
Dr. Jeff Lee  
Office: Holden Hall 212; Phone: 806-834-8228  
E-mail: jeff.lee@ttu.edu. Office hours: MWF: 9 to 10 or by appointment.

This course deals with the arid and semi-arid regions of the world. We will explore these lands through a combination of relevant topics and regional studies. While the main focus will be on the scientific aspects of the environments, humanistic approaches to the study of arid lands will be part of the course as well.

Grading:  
1. Exam 1 (50 points)  
2. Exam 2 (50 points)  
   This is an essay on a topic inspired by a book on drylands.  
4. Term Paper (50 points). 2000-3000 words, double spaced. A literature review of a topic related to drylands; topic must be approved. The paper will be done in stages.  
   Preliminary literature list (10 points) Due 11 October  
   Outline of paper (10 points) Due 23 October  
   First Draft (20 points) Due 11 November  
   Final Draft (10 points) Due 25 November  
5. Class Project (50 points). Group work on the creation of an atlas of global drylands. Student score related to contributions to the group effort.  
6. Individual presentation of contribution to class project (15 points). Make a presentation to class on one aspect of the class project or the topic of term paper.

Special Needs: Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible to make necessary accommodations. Students should present appropriate verification for Disabled Students Services, Dean of Students Office. A student who is absent from classes for the observation of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence if, not later than the fifteenth day after the first day of the semester, the student had notified the instructor of each scheduled class that the student would be absent for a religious holy day.

Required Text: Laity, Julie, 2008. Deserts and Desert Environments, Wiley-Blackwell. Additional readings will be assigned during the semester and students will choose a book to read.

Learning outcomes and assessments:  
1. Students will be able to define, describe and explain the following topics about the world’s drylands: locations, climate, flora and fauna, hydrology, soils and landforms. This is assessed through exams.  
2. Students will be able to research and write a high quality literature review. This is assessed through the paper.  
3. Students will be able to write an interesting and well-written essay based on a book. This is assessed through the book report.  
4. Students will learn to contribute to a group research project (developing an atlas). This is assessed through the class project.
Schedule
(Class time will be a combination of lecture, discussion and group project work)

Week of: 

26 August 
Introduction 
Reading (Laity) Ch. 1

2 September 
Defining Arid Lands, Global Dist. Ch. 2

9 September 
Climate (no class Monday) Ch. 3

16 September 
Hydrology Ch. 4, 5

23 September 
Soils Ch. 7

30 September 
Geomorphology Ch. 6, 8, 9, 10,

Exam 1: Wednesday, 2 October

7 October 
Geomorphology

14 October 
Plants Ch. 11

21 October 
Animals Ch. 12

28 October 
Land Degradation Ch. 13

4 November 
Land Degradation

11 November 
Regions: N & S America

18 November 
Regions: Africa & Australia

25 November 
Regions: Asia & Europe

2 December 
Project Presentations

Exam 2: 
4:30 to 7:00 PM Saturday 11 December
GEOG 5306: Seminar in Geography of Arid Lands

Dr. Jeff Lee
Office: Holden Hall 209a; Phone: 742-2466 ext. 247;
E-mail: jeff.lee@ttu.edu. Office hours: MWF: 2 to 3 or by appointment.

This course deals with the arid and semi-arid regions of the world. We will explore these lands through a combination of relevant topics and regional studies. While the main focus will be on the scientific aspects of the environments, humanistic approaches to the study of arid lands will be part of the course as well.

Grading:
1. Exam 1 (50 points)
2. Exam 2 (50 points)
3. Term Paper (100 points). 2000-3000 words, double-spaced. A literature review of a topic related to drylands; topic must be approved. The paper will be done in stages.
   Preliminary literature list (20 points) Due 12 October
   Outline of paper (20 points) Due 24 October
   First Draft (40 points) Due 12 November
   Final Draft (20 points) Due 28 November
4. Group Research Project (50 points). Group work on the creation of an atlas of global drylands. Student score related to contributions to the group effort.
5. Lecture to class on a pre-approved topic, 30 to 50 minutes (20 points).

Special Needs: Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible to make necessary accommodations. Students should present appropriate verification for Disabled Students Services, Dean of Students Office. A student who is absent from classes for the observation of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence if, not later than the fifteenth day after the first day of the semester, the student had notified the instructor of each scheduled class that the student would be absent for a religious holy day.

Required Text: Laita, Julie, 2008. Deserts and Desert Environments, Wiley-Blackwell. Additional readings will be assigned during the semester and students will choose a book to read.

Learning outcomes and assessments:
1. Students will be able to define, describe and explain the following topics about the world’s drylands: locations, climate, flora and fauna, hydrology, soils and landforms. This is assessed through exams.
2. Students will be able to research and write a high quality literature review. This is assessed through the paper.
3. Students will learn to contribute to a group research project. This is assessed though the research project.

Schedule
(Class time will be a combination of lecture, discussion and group project work)

Week of:          Reading (Laita)

27 August         Introduction          Ch. 1
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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Chapters</th>
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<tbody>
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<td>Defining Arid Lands, Global Dist.</td>
<td>Ch. 2</td>
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<td>10 September</td>
<td>Climate (no class Monday)</td>
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<td>17 September</td>
<td>Hydrology</td>
<td>Ch. 4, 5</td>
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<td>24 September</td>
<td>Soils</td>
<td>Ch. 7</td>
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<td>1 October</td>
<td>Geomorphology</td>
<td>Ch. 6, 8, 9, 10,</td>
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<td><strong>Exam 1</strong>: Wednesday, 3 October</td>
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<td>8 October</td>
<td>Geomorphology</td>
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<td>15 October</td>
<td>Plants (no class Mon)</td>
<td>Ch. 11</td>
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<td>22 October</td>
<td>Animals</td>
<td>Ch. 12</td>
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<td>29 October</td>
<td>Land Degradation</td>
<td>Ch. 13</td>
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<td>5 November</td>
<td>Land Degradation</td>
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<td>12 November</td>
<td>Regions: N &amp; S America</td>
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<td>19 November</td>
<td>Regions: Africa &amp; Australia</td>
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<td>26 November</td>
<td>Regions: Asia &amp; Europe (Mon only)</td>
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<td>3 December</td>
<td>Conclusions</td>
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**Exam 2:** 8:30 a.m. – 10:00 a.m. Saturday 11 December
GEOL 5325/4300 PETROPHYSICS

Place: Rm 230 Science Building  Time: 12:30 – 1:50pm TuTh
Instructor: Dr. G.B. Asquith  Office Hours: 8:00am – 10:00am MW Rm 332A
George.Asquith@ttu.edu
Exams: 2 33% each plus a Final 33%

I.) INTRODUCTION:
   What is a well log and types of information from well logs.
   Types of Well Logs [open-hole and cased-hole]
   Non-wireline logs
   Electrical
   Spontaneous Potential (SP)
   Resistivity
   Dielectric
   Nuclear
   Gamma Ray (GR)
   Bulk Density (ρb)
   Neutron (Φn)
   Photoelectric (Pe)
   Magnetic Resonance Imaging Logs (MRI)
   Acoustic or Sonic Logs

II.) BOREHOLE ENVIRONMENT:

III.) DETERMINATION of FORMATION TEMPERATURE (Tf) and CORRECTION of
      RESISTIVITY to Tf.

IV.) FORMATION WATER RESISTIVITY (Rw) and VOLUME of CLAY from SPONTANEOUS
     POTENTIAL LOG (SP):

V.) DETERMINATION of VOLUME of CLAY from GAMMA RAY LOG (GR):

VI.) DETERMINATION of POROSITY and LITHOLOGY from SONIC and NUCLEAR LOGS
     plus VOLUME of CLAY from NEUTRON-DENSITY LOGS:

VII.) DIELECTRIC LOGS:

VIII.) MAGNETIC RESONANCE IMAGING LOGS (MRI):

IX.) RESISTIVITY LOGS, RESISTIVITY INVASION PROFILES, and DETERMINATION of
     TRUE FORMATION RESISTIVITY (Rt):

X.) DETERMINATION of ARCHIE PARAMETERS “a” (tortuosity factor), “m” (cementation
    exponent), and “n” (saturation exponent):

XI.) ARCHIE WATER SATURATION and an INTRODUCTION to SHALY SAND ANALYSIS:

XII.) ADDITIONAL WELL LOGGING TECHNIQUES:
     Quick-Look Methods
     The Ratio Methods (Swr and SW/Sxo)
     Bulk Volume Water (BVW)
     Log Derived Permeability
     The DEW Cross Plot (Rt/Rw versus Rxo/Rmf)

XIII.) LOG EVALUATION of SHALES

LEARNING OUTCOMES:
1.) At the conclusion of this course in petrophysics the student will be able to do the
    following:
2.) Scan a well log and identify any porous and permeable zones (reservoirs) that have the
    potential to produce hydrocarbons using resistivity invasion profiles and Quick-Look
    Methods.
3.) Scan a well log to verify the quality of the logging measurements.
4.) Determine lithology, porosity and clay content of potential reservoirs.
5.) Determine the resistivity of the water (Rw) in the reservoir and the true formation
    resistivity (Rt).
6.) Use porosity, Rw, and Rt plus the Archie Equation to calculate the amount of water and
    hydrocarbons in the reservoir.
7.) Determine hydrocarbon producibility using the Ratio Methods.
8.) From the above analysis they should be able to determine the hydrocarbon productive potential of a reservoir.

ASSESSMENTS:
In order to assess how well the students have learned the material and method taught, ALL exams are real world well log examples from my personnel collection of well logs complete with what the reservoir produced. In addition we will work some logging problems in class together that will be evaluated, but no grades will be given.

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 306-742-2405.

EXCUSED ABSENCES FOR RELIGIOUS DAYS FOR STUDENTS:
Amendment to section 4.4 of Board rules-the amendment implements a change mandated by House Bill 256 of the 78th Legislature. The amendment removes a requirement that a student must notify his or her instructor in advance of any absence for the purpose of observing a religious holy day. Students will no longer be required to notify their instructors in advance regarding such absences. House Bill 256 also requires that a student shall be excused from attending classes or other required activities, including examinations, during time needed for travel for the purpose of the observance of a religious holy day, and it includes a provision for the resolution of any disputes that could arise regarding the nature of an absence under this section, or the provision for a reasonable time in which to make up the work that was missed during such an absence.
PROBLEMS IN PALEONTOLOGY

GEOLOGY 5300: INDIVIDUAL STUDIES IN GEOLOGY FALL 2014
MONDAY AND WEDNESDAY: 2:00 – 3:20 pm ROOM: SCIENCE # 204
INSTRUCTOR: SANKAR CHATTERJEE, HORN PROFESSOR
OFFICE: GEOSCIENCES 220/ Museum J17 (Basement)
PHONE: 742-1986/3108 E-MAIL: sankar.chatterjee@ttu.edu
OFFICE HOURS: Wednesday 10-11 am, or by appointment

Course description and purpose: The content of the lectures will emphasize recent advancements and controversies in the major events in the history of life in a phylogenetic context. The following topics will trace the fossil record of the four billion years of life: Origin of life, Precambrian life, metazoans, conodonts and fish, early tetrapods, plants, reptiles, synapsids and early mammals, dinosaurs, pterosaurs, birds, primates and hominids. Just as with human history, events in the history of life don’t exist in isolation; they are determined by contingency: what happened before and determine what will come after. The student is also expected to learn something about tools we use to learn about life in the past (particularly evolutionary theory), and also gain an appreciation for the size and complexity of modern biodiversity.

The course is focused to geology/biology graduate students who want to specialize in paleontology and evolution. This course introduces students to modern concepts and techniques in the study of fossils. The main thrust of this course is to teach students how to think, write, and present a paleontological paper in a professional meeting and publish it in a scientific journal.

Text: There is no textbook for the course.

Seminar: Because of the great strides, which have taken place in the past decades in the field of paleontology and evolutionary biology, group discussions should follow after each lecture. Useful references and papers will be distributed in the class.

Term paper: The term paper should be based on any problem of your choice listed in the outline of the course. Follow the style of Journal of Paleontology to write your paper (20-page limit). You will present the paper with power point at the end of the semester.

Grading: Course grades will be based on term paper (80%), and seminar performance (20%).

Methods of assessment: Learning would be assessed on the basis term paper, surprise quizzes, and seminar performance. Both seminars and term papers will determine the aptitude of the students in independent research in the field of paleontology and evolution.

Grading scale: 100-90% A, 89-80% B, 79-70%, 69-60 D, 59 or less F
**Expected learning outcome:** Upon completing this course, students will be able to understand:
1) Biodiversity; 2) organic evolution; 3) origin, evolution, and radiation of life for the last four billion years—from bacteria to humankind; 4) periodic mass extinctions; 5) phylogeny.

**Attendance:** There is a direct correlation between grade and attendance. All quizzes will be based entirely on class notes and discussions. You are responsible (even you miss a lecture) for all announcements and course changes that are made.

**Disabling condition:** Any student, who, because of disabling condition, may require some special arrangements in order to meet course requirements, should contact me ASAP so that necessary accommodations can be made.

**Excused absences for religious holidays:** A student is excused from attending classes or other required activities, including examinations, during time needed for travel for the purpose of the observance of a religious holy day.

*Museum visit: There will be a special field trip to the TTU Museum at 4th & Indiana (11/12, Wednesday, 2 pm) during the lecture hour to study the dinosaurs and their relatives. Don’t miss this opportunity.*

**Academic Misconduct:** See the University catalogue about policies regarding academic integrity, cheating, and plagiarism.
# SYLLABUS

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<td>No class, SVP meeting, Berlin</td>
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<td>11/12</td>
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<td>12/8</td>
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SPRING 2011
GEOGRAPHY 4302 / 5302
ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

Dr. Kevin R. Mulligan Class: MW 2:00 – 2:50 p.m.
Office: 208 Holden Hall Phone: 742-2466 x 243
Office Hours: TuTh 10:00 – 11:00 p.m. or by appointment. Email: kevin.mulligan@ttu.edu
Lab Instructors: Chris Van Nice, 211 Holden Hall, chris.van-nice@ttu.edu

Course web site: http://gis.ttu.edu/geog4302

Course Objective: This course is a second course in GIS designed as a continuation of GEOG 3300/5300. The intent of the course is to learn the principle extensions to ArcGIS and related topics dealing with the creation and analysis of GIS data, data sources, advanced cartographic techniques and internet mapping.

Learning Outcomes: After completing this course, students will be able to:

1) explain the difference between the vector, raster and TIN data models,
2) apply advanced geoprocessing techniques in the analysis of vector and raster data,
3) apply advanced cartographic techniques in the creation publication quality maps,
4) obtain and use GIS data from Internet sources and evaluate the quality of the data.

Prerequisites: Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GEOG 3300/5300 or an equivalent course.

Laboratory: You are required to enroll in the lab for either GEOG 4302/5302.

Required Text: none (we will use the Esri Virtual Campus as an online resource)

Required USB Flash Drive: To save your work, you will need to purchase a USB flash drive. Given that GIS data can take up a lot of space, a 2 GB flash (or larger) is recommended.

Assessment and Grading: Your grade in this course will be based on several factors: 1) a midterm and final exam, 2) completion of a class project, and 3) completion of a final project. The midterm and final exams will each be worth 100 points. The class project will be worth 40 points and the final project will be worth 60 points. Your grade is therefore based on a total of 300 points. To ensure a grade in this course you must meet the following minimum requirements:
A - 90%, B - 80%, C - 70%, D - 60%

Exam: The midterm and final exams will consist of a combination of multiple choice, short answer and short essay questions. The exams will be based upon the materials covered in the lectures and lab.

Class Attendance: You are expected to attend all of the scheduled classes. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Missed Information: If you miss a lab, it is your responsibility to complete the exercise on your own (or with the help of your classmates).

Withdrawing: You are responsible for dropping the class. The last day to drop is Wednesday, March 23rd, 2011.

Disability Statement: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.
<table>
<thead>
<tr>
<th>JAN 12</th>
<th>Introduction (course topics and logistics)</th>
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<tbody>
<tr>
<td>17</td>
<td>Martin Luther King, Jr. Day – no class</td>
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<tr>
<td>19</td>
<td>Review of the ArcGIS Environment</td>
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<td>24</td>
<td>Discrete and Continuous Rasters</td>
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<td>26</td>
<td>Digital Elevation Models</td>
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<tr>
<td>31</td>
<td>Spatial Analyst - Getting Started</td>
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<tr>
<td>FEB 02</td>
<td>Spatial Analyst- Analyzing Surfaces</td>
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<tr>
<td>07</td>
<td>Spatial Analyst - Working with Map Algebra</td>
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<tr>
<td>09</td>
<td>Spatial Analyst - Interpolating Raster Surfaces</td>
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<tr>
<td>14</td>
<td>Spatial Analyst - Mapping Distance and Density</td>
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<tr>
<td>16</td>
<td>Spatial Analyst - Cell, Neighborhood and Zonal Statistics</td>
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<tr>
<td>21</td>
<td>3D Analyst – Introduction to ArcGIS 3D Analyst</td>
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<tr>
<td>23</td>
<td>3D Analyst – Displaying 3D data</td>
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<tr>
<td>28</td>
<td>3D Analyst – Symbolizing and Analyzing Data</td>
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<tr>
<td>MAR 02</td>
<td>3D Analyst – Creating and Converting 3D Data</td>
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<tr>
<td>07</td>
<td>Review of the Spatial and 3D Extensions</td>
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<td>09</td>
<td>EXAM 1</td>
</tr>
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<tr>
<td>21</td>
<td>Introduction to the Class Project</td>
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<tr>
<td>23</td>
<td>The Geostatistical Analyst Extension</td>
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<tr>
<td>28</td>
<td>Using Map Services</td>
</tr>
<tr>
<td>30</td>
<td>Creating a Map Services</td>
</tr>
<tr>
<td>APR 04</td>
<td>Virtual Globes - Working with ArcGIS Explorer</td>
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<tr>
<td>06</td>
<td>Virtual Globes - Working with Google Earth</td>
</tr>
<tr>
<td>11</td>
<td>Working with Bing Maps</td>
</tr>
<tr>
<td>13</td>
<td>Managing Spatial Data - File Geodatabases</td>
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<tr>
<td>18</td>
<td>Managing Spatial Data - Personal Geodatabase</td>
</tr>
<tr>
<td>20</td>
<td>Managing Spatial Data - Enterprise Environment</td>
</tr>
<tr>
<td>25</td>
<td>University Holiday - no class</td>
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<tr>
<td>27</td>
<td>Designing and Building a GIS</td>
</tr>
<tr>
<td>MAY 02</td>
<td>Creating Metadata and Data Dictionaries</td>
</tr>
<tr>
<td>04</td>
<td>Individual Study Day – no class</td>
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<tr>
<td>09</td>
<td>EXAM 2 - Monday, May 09, 4:30 – 7:00 p.m.</td>
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<table>
<thead>
<tr>
<th>LAB</th>
<th>TOPIC</th>
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</thead>
</table>
| 1   | Map Assignment 1  
|     | Esri VC Working with Rasters 1,2 and 3 |
| 2   | Map Assignment 2  
|     | Esri VC Spatial Analyst 1 and 2        |
| 3   | Map Assignment 3  
|     | Esri VC Spatial Analyst 3 and 4        |
| 4   | Map Assignment 4  
|     | Esri VC Spatial Analyst 5 and 6        |
| 5   | Map Assignment 5  
|     | Esri VC 3D Analyst 1 and 2             |
| 6   | Map Assignment 6  
|     | Esri VC 3D Analysis 3 and 4            |
| 7   | Map Assignment 7  
|     | Esri VC 3D Analyst 5, 6 and 7          |
| 8   | Map Assignment 8 - class project        |
|     | Esri VC Geostatistical Analyst 1        |
| 9   | Map Assignment 9 - class project        |
|     | Esri VC Natural Resources 1 and 2       |
| 10  | Map Assignment 10 - class project       |
|     | Esri VC Natural Resources 3 and 4       |
| 11  | Final Project - (open lab time)         |
|     | Esri VC Managing Geodatabases 1 and 2   |
| 12  | Final Project (open lab time)           |
|     | Esri VC Managing Geodatabases 3 and 4   |
| 13  | Final Project (open lab time)           |
|     | Esri VC Managing Geodatabases 3 and 4   |
| 14  | Open Lab - (Mon, Tues, Wed)             |

FINAL PROJECT DUE at FINAL EXAM
Economic Geography
Geography 3337

Instructor: Perry Carter
Office: 210 Holden Hall
Phone: 2-2246
e-mail: perry.carter@ttu.edu
Office hour: Tue. 11:00-12:00; Wed. 1:30-3:30

Class room: Holden 284
Day & time: Tuesdays, 6:00-9:00 PM

Description and Objectives of the Course

This course is about exchanges that take place across space. Economics in its most basic sense is about people trading what they have for what they do not have, which makes economics an inherently social process — i.e. economics is about people. As Geographers we know that geography in its most basic sense is about space and that everything is situated in space. Economic Geography is therefore about human beings as producers and consumers of goods and services and how this trade (exchange) in goods and services connects people across the world, across spaces. Because human beings are central to economics (without them there would be no economy) this course will forces on people as both producers and consumers of economic goods and services — commodities.

There are three primary objectives of this course:

- To trace the paths from where products are made to where products are consumed (purchased)
- To look beyond products themselves and understand that all products are a product of labor
- To come to understand that the consumption of products is often more about human desire than it is about human need.

Texts
Tangled Routes 2nd Edition by Deborah Barndt
Economic Geography: A Contemporary Introduction by Coe, Kelly, & Yeung
Manufacturing Time: Global Competition in the Watch Industry, 1795-2000 by Amy Glasmeir

Software
Indiemapper — go to indiemapper.com and use the 30 day free trial; after that run out pay the educational rate of $20 month (more details next week).
Grading and Work Requirements
Your grade in this course will be determined by your performance across four primary criteria: short exams, written reviews of the readings, synopses, and mapping analysis excises.

1. Exams: All exams will be over assigned readings from the three class texts. There will be four exams each worth 11 points for a total of 44 points towards your final grade.

2. Written reviews: Like the exams these reviews will be over the readings assigned the previous week. They should be a page long with the first 3/4th of the paper being a summary of what you read and the last 1/4th being your opinions on what you read. You need to show me that you not only read but you also thought about what you read. There will be 14 of these reviews each worth 2 points for a total of 28 points towards your final grade.

3. MarketPlace Synopses: Go to the website marketplace.publicradio.org, pick a story, and listen or read it; and write a synopsis (see example below). There are ten synopses worth 1 point each for a total of 10 points toward your final grade. Each synopsis must be at least 200 words long.

4. Mapping Analysis Excises: After a two week introduction there will be nine economic mapping analysis assignments using indiemapper. Each excise is worth 2 points for a total of 18 points towards your final grade.

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Readings (pages in the books)</th>
<th>Assignments</th>
<th>Synopses</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 18:</td>
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<tr>
<td>Jan 25:</td>
<td>Coe 1-55</td>
<td>review 1</td>
<td>1</td>
<td>-1</td>
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<tr>
<td>Feb 1:</td>
<td>Coe 59-86; Glasmeir v-vii</td>
<td>review 2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Feb 8:</td>
<td>Coe 87-118; Glasmeir 1-14</td>
<td>exam 1, review 3</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Feb 15:</td>
<td>Coe 119-152; Glasmeir 15-39</td>
<td>review 4</td>
<td>4</td>
<td>2</td>
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<td>Feb 22:</td>
<td>Coe 153-183; Glasmeir 40-63</td>
<td>review 5</td>
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<td>6</td>
<td>4</td>
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<tr>
<td>Mar 1:</td>
<td>Coe 223-251; Glasmeir 88-106</td>
<td>review 7</td>
<td>7</td>
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<td>exam 3, review 10</td>
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<td>Apr 5:</td>
<td>Barndt 94-132; Glasmeir 203-241</td>
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<td></td>
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</table>
Synopsis Example:

Student Name: Omar Klienwald

How is the phone book still surviving?

The Internet has hurt newspapers and the post office. And you would think you could add the phone book to the list, yet the telephone directory is still hanging on. Ammon Shea, author of "The Phone Book: The Curious History of the Book That Everyone Uses But No One Reads," talks with Bill Radke about why the phone book may survive.

Is the phone book doomed? Ammon Shea thinks innate human laziness has more to do with its survival than anything else. For example, in Norway, which is considerably more environmentally conscious than the U.S., they have had an opt-out in policy in place for years, meaning if you don't want a telephone book just call and they will not send you one. And approximately 7 percent of the population takes the time to pick up the phone and say, "Don't send me a telephone book."

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Source: Marketplace, October 11, 2010
Economic Geography
Geography 3337

Instructor: Perry Carter
Office: 210 Holden Hall
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e-mail: perry.carter@ttu.edu
Office hour: Tue. 11:00-12:00; Wed. 1:30-3:30

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Student Name: Omar Klienwald

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Source: Marketplace, October 11, 2010
GEOGRAPHY 3363:  
GEOGRAPHY OF SOUTH AMERICA  
SPRING SEMESTER 2011

Instructor: Dr. Cynthia L. Sorrensen  
Office: Holden Hall 215  
Office Hours: Tuesdays & Thursdays 1:00pm - 2:00pm or by appointment  
Email: cynthia.sorrensen@ttu.edu  
Class Time: Wednesdays, 4:00pm - 6:50pm  
Class Location: HH 233

Catalog Description: Study of the physical and human geography of South America, with special emphasis on contemporary issues. Fulfills multicultural requirement.

Course Purpose Statement: This course satisfies the Texas Tech University core curriculum requirement in multicultural.

Competency Statement for Multicultural: Students graduating from Texas Tech University should be able to demonstrate: awareness of knowledge of distinctive cultures or sub-cultures - including but not limited to ethnicity, gender, class, political systems, religions, language, or human geography

Course Description: This course takes a look at the region of South America through a study of its development and continued articulation with the world economy. Globalization is often the contemporary term we use to describe the spatial ramifications of an increasingly integrated world economy. However, South American peoples and nations have experienced forms of globalization since colonial contact and likely even before. We will look specifically at the contemporary ramifications of globalization with specific focus on rural and urban spaces. Throughout we will keep in mind one underlying question: how has economic development influenced the quality of life for the people of South America?

Class sessions will contain a mixture of lectures, films, and discussions that depend on your participation. I expect students to come to class having read the assigned readings and prepared to voice their opinions, curiosities, and concerns about these readings.

Expected Learning Outcomes: upon completion of this course you will be able to:

1. Recognize and articulate the major development phases (export led growth, import substitution, Neoliberalism) which South American countries have experienced.
2. Articulate and critique major development theories (modernization, dependency, globalization).
3. Apply development theory to contemporary development issues experienced in South American countries.
4. Describe major development impacts in urban and rural areas of South America.
5. Demonstrate awareness and knowledge of cultural differences within global societies outside of the U.S.

Methods for Assessing the Expected Learning Outcomes: See course requirements for grade allocation of assessment methods.

Expected Learning Outcome 1:

Your ability to recognize and articulate major development phases will be assessed in writing through two exams. Your ability to recognize and articulate these theories verbally will be assessed through weekly class discussions. Your ability to articulate and critique these theories in writing will be assessed through three written assignments.

Expected Learning Outcome 2 & 5:

Your ability to critique major development theories (modernization, dependency, globalization) and demonstrate awareness/knowledge of cultural differences will be assessed through two written exams and the final region report.

Expected Learning Outcome 3:

Your ability to apply development theory to explain contemporary development issues and explain these issues in light of larger globalization processes will be assessed through three written assignments. In addition Expected Learning Outcome 5 will be assessed through two exams.

Expected Learning Outcome 4:

Your ability to describe and compare the major development issues in urban and rural areas of South America will be assessed in writing through weekly quizzes and two exams.

Course Texts:


All the above books are on 2 hour reserve at the Texas Tech library. Any additional readings will also be made available on 2 hour reserves or on the course website at [www.blackboard.ttu.edu](http://www.blackboard.ttu.edu).

**Course Requirements:**

**Weekly Quizzes on Readings:** Starting in the third week of classes, there will be weekly quizzes on the readings. These quizzes will consist of 3-4 questions to be answered in sentence form. I will drop two of the quizzes and average the rest. Altogether the weekly quizzes are worth 20% of your grade.

**Tests:** There are two tests in this class and are noted in the course schedule. Each will focus on readings assigned, lectures, and other material discussed in class up until the day of that test. Each test will consist of short answer and essay questions. Each is worth 20% of your final grade.

**Extended Book Review and Development Report:** There is one major written assignment for this course. It consists of an extensive book review based on a book that deals with a contemporary development issue within a South American country. The Report will include both the book review and discussion of the current impacts of Neoliberalism in the country selected. More information on this assignment is forthcoming. This assignment is worth 30% of your grade.

**Participation:** Throughout the semester there will be ample time for discussion on readings, films, and lectures. Your participation is critical in these discussions. In addition, attendance will be accounted for in the participation grade. Participation is worth 10% of your final grade.

**The Breakdown:**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Quizzes</td>
<td>10 quizzes, two dropped</td>
<td>20%</td>
</tr>
<tr>
<td>Tests</td>
<td>2 @ 20 points each</td>
<td>40%</td>
</tr>
<tr>
<td>Book Review / Development Report</td>
<td>30 points</td>
<td>30%</td>
</tr>
<tr>
<td>Participation</td>
<td>10 points</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>100%</td>
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</table>
Grading Scale:

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>94% +</td>
<td>A</td>
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<tr>
<td>90% - 93%</td>
<td>A-</td>
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<tr>
<td>87% - 89%</td>
<td>B+</td>
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<tr>
<td>84% - 86%</td>
<td>B</td>
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<tr>
<td>80% - 83%</td>
<td>B-</td>
</tr>
<tr>
<td>77% - 79%</td>
<td>C+</td>
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<tr>
<td>74% - 76%</td>
<td>C</td>
</tr>
<tr>
<td>70% - 73%</td>
<td>C-</td>
</tr>
<tr>
<td>67% - 69%</td>
<td>D+</td>
</tr>
<tr>
<td>60% - 66%</td>
<td>D</td>
</tr>
<tr>
<td>below 60%</td>
<td>F</td>
</tr>
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Jan. 26  Independence & Commodity Trade  
   *From Silver to Cocaine, Chapters 9 & 10*

Feb. 2   Autarky & Import Substitution Industrialization  
   Film: The Garden of Forking Paths

Feb. 9   Debt Crisis & Neoliberalism (Market Triumphalism)  
   *Victims of the Chilean Miracle, pg 125-163*  
   Film: Capital Sins

Feb. 16  Test 1

Impacts of Neoliberalism in Urban & Rural Spaces - spaces as intertwined economic sectors

Feb. 23  Neoliberalism, Cities & Labor  
   *The Spectacular City, Introduction, Chapter 2 & 3*

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        Crude Chronicles, Opening

Mar. 16  Spring Break

Mar. 23  Neoliberal Landscapes
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Apr. 6   Responses to Neoliberalism
        Victims of the Chilean Miracle, pg 337-388
        Crude Chronicles, Chapter 4

Apr. 13  AAG - no class

Apr. 20  Test II

Apr. 27  Responses to Neoliberalism
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        Crude Chronicles, Chapter 5

May 7   Extended Book Review Due by 5pm

quiz #6

quiz #7

quiz #8

quiz #9

quiz #10
GEOGRAPHY 5303:
GEOGRAPHY OF SOUTH AMERICA
SPRING SEMESTER 2011

Instructor: Dr. Cynthia L. Sorrensen  Class Time: Wednesdays, 4:00pm - 6:50pm
Office: Holden Hall 215  Class Location: HH 233
Office Hours: Tuesdays & Thursdays 1:00pm - 2:00pm or by appointment
Email: cynthia.sorrensen@ttu.edu

Catalog Description: Study of the physical and human geography of South America, with special emphasis on contemporary issues. Fulfills multicultural requirement.

Course Purpose Statement: This course satisfies the Texas Tech University core curriculum requirement in multicultural.

Competency Statement for Multicultural: Students graduating from Texas Tech University should be able to demonstrate: awareness of knowledge of distinctive cultures or sub-cultures - including but not limited to ethnicity, gender, class, political systems religions, language, or human geography.

Course Description: This course takes a look at the region of South America through a study of its development and continued articulation with the world economy since Spanish and Portuguese colonization in the late 1400s. Globalization is often the contemporary term we use to describe the spatial ramifications of an increasingly integrated world economy. However, South American peoples and nations have experienced forms of globalization since colonial contact and likely even before. We will look specifically at the contemporary ramifications of globalization with specific focus on rural and urban spaces. Throughout we will keep in mind one underlying question: how has economic development influenced the quality of life for the people of South America?

Class sessions will contain a mixture of lectures, films, and discussions that depend on your participation. I expect students to come to class having read the assigned readings and prepared to voice their opinions, curiosities, and concerns about these readings.

Expected Learning Outcomes: upon completion of this course you will be able to:

1. Recognize and articulate the major development phases (colonialism, export led industrialization, import substitution, neoliberalism) which South American countries have experienced.
2. Articulate and critique major development theories (modernization, dependency, globalization).
3. Apply development theory to contemporary development issues experienced in South American countries.
4. Describe major development impacts in urban and rural areas of South America
5. Demonstrate awareness and knowledge of cultural differences within global societies outside of the U.S.

Methods for Assessing the Expected Learning Outcomes: See course requirements for grade allocation of assessment methods

Expected Learning Outcome 1:

Your ability to recognize and articulate major development phases will be assessed in writing through two exams. Your ability to recognize and articulate these theories verbally will be assessed through weekly class discussions. Your ability to articulate and critique these theories in writing will be assessed through three written assignments.

Expected Learning Outcome 2 & 5:

Your ability to critique major development theories (modernization, dependency, globalization) and demonstrate awareness/knowledge of cultural differences will be assessed through two written exams and the final regional report.

Expected Learning Outcome 3:

Your ability to apply development theory to explain contemporary development issues and explain these issues in light of larger globalization processes will be assessed through three written assignments. In addition Expected Learning Outcome 5 will be assessed through two exams.

Expected Learning Outcome 4:

Your ability to describe and compare the major development issues in urban and rural areas of South America will be assessed in writing through weekly quizzes and two exams.

Course Texts:

Topik, S., Marichal, C., and Zephyr, F. 2006. From Silver to Cocaine; Latin American
Commodity Chains and the Building of the World Economy, 1500-2000. Durham, NC:
Duke University Press.
Winn, P. (ed.) 2004. Victims of the Chilean Miracle: Workers and Neoliberalism in the
Wright, A. and Wolford, W. 2003. To Inherit the Earth: the Landless Movement and the

All the above books are on 2 hour reserve at the Texas Tech library. Any additional
readings will also be made available on 2 hour reserves or on the course website at
www.blackboard.ttu.edu.

Course Requirements:

Weekly Quizzes on Readings: Starting in the third week of classes, there will be
weekly quizzes on the readings. These quizzes will consist of 3-4 questions to be
answered in sentence form. I will drop two of the quizzes and average the rest.
Altogether the weekly quizzes are worth 20% of your grade.

Tests: There are two tests in this class and are noted in the course schedule. Each will
focus on readings assigned, lectures, and other material discussed in class up until the
day of that test. Each test will consist of short answer and essay questions. Each is
worth 20% of your final grade.

Extended Book Review and Development Report: There is one major written
assignment for this course. It consists of an extensive book review based on a book
that deals with a contemporary development issue within a South American county.
The Report will include both the book review and discussion of the current impacts of
neoliberalism in the country selected. More information on this assignment is forth
coming. This assignment is worth 30% of your grade.

Participation: Throughout the semester there will be ample time for discussion on
readings, films, and lectures. Your participation is critical in these discussions. In
addition, attendance will be accounted for in the participation grade. Participation is
worth 10% of your final grade.

The Breakdown:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (%)</th>
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<tbody>
<tr>
<td>Weekly Quizzes, 9 - 12 quizzes, two dropped</td>
<td>20%</td>
</tr>
<tr>
<td>Tests</td>
<td>40%</td>
</tr>
<tr>
<td>Book Review / Development Report</td>
<td>30%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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Grading Scale:

<table>
<thead>
<tr>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>94% +</td>
<td>A</td>
</tr>
<tr>
<td>90% - 93%</td>
<td>A-</td>
</tr>
<tr>
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<td>B+</td>
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Feb. 2   Autarky & Import Substitution Industrialization
         quiz #1
         Condes, R. "Export-Led Growth in Latin America: 1870-1930", Journal of
         Latin American Studies, 24:163-179. (Blackboard)

Feb. 9   Debt Crisis & Neoliberalism (Market Triumphalism)
        quiz #2
         Victims of the Chilean Miracle, pg 125-163
         Film: The Garden of Forking Paths
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Feb. 16  Test 1

Impacts of Neoliberalism in Urban & Rural Spaces - spaces as intertwined economic sectors

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         To Inherit the Earth, Chapter 1
         Film: Villa El Salvador: A Desert Dream

Mar. 9   Agrarian Reform & Frontier Expansion
         quiz #6
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May 7   Extended Book Review Due by 5pm

quiz #7

quiz #8

quiz #9

quiz #10
BIOGEOGRAPHY
GEOG 4321-001     Spring 2011
Tuesday and Thursday 4-5:50 pm
Holden Hall 221

Professor: Dr. Tina Delahunty
Office Location: Holden Hall 217
Office Hours: Wednesday 12-3pm
Feel free to stop by or call/email to set up another time
Office Telephone: 742-2466 ext. 250
Email: tina.delahunty@ttu.edu (Be sure to enter Biogeography on the subject line)

Catalog Description:
Prerequisite: GEOG 1401 or consent of instructor. Study of plants and animals in their spatial context,
functional interaction, and as related to human impacts.

Further Description:
The main purpose of this course is to provide an opportunity to understand the spatial context of plants and
animals in their physical environment. Students will discover, through the evaluation and discussion of lectures
and literature, the complexity and interrelatedness of the Earth’s biosphere. Ultimately, the exploration of
biogeographic concepts will result in a better understanding of the current global environment and the human
place within it.

<table>
<thead>
<tr>
<th>Expected Learning Outcomes/Cognitive Objectives:</th>
<th>Methods of Assessment:</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>1) List and explain biogeographic variables</td>
<td>Objective testing (multiple choice, true-false, and fill in the blank questionnaires)</td>
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<td>2) Describe, and discuss the major principles of, commonly used vegetation classification systems</td>
<td>Classroom assessment (two minute papers and focus groups)</td>
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<td>Individual reflection (the creation and presentation of PowerPoints, in-class discussion and debate regarding reading assignments, and concept mapping)</td>
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<td>4) a) Sketch, by hand, a map of the physical geography of at least two continents</td>
<td>Journal article finds (Lickert scoring on articles utilized in research)</td>
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<tr>
<td>b) Explain in biogeographic terms how the physical geography relates to biogeography</td>
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<td>5) Interpret climatological and population ecology graphs and charts</td>
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<td>11) Locate appropriate refereed journal articles on the subject at hand (and utilize them for the above objectives)</td>
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Methods of Assessment Continued:
In addition to the above assessments, student performance will be measured through peer evaluation. Several topics will be researched and discussed in groups. Upon completion of each collaborative project, peers will submit reports on the thoroughness and participation of each group member. Student ability to reflect upon, explain, and discuss learned material largely determines the course grade received, so students must clearly demonstrate their knowledge, observations, critiques, etc. through the above assessments. Participation and noteworthy attendance are mandatory in order to perform well on classroom, individual, and collaborative projects.

Grading:
Each objective testing, classroom assessment, individual reflection, and specified journal article find will be worth from 5 to 10 points unless otherwise specified. Each student’s lowest grade on a 10 point assignment will be dropped at the end of the semester (this can be used to negate points lost because of an absence). At the end of the semester, all points will be added and the percentage of total possible points will determine the letter grade received. Letter grades will be based on the traditional grading scheme of 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 59% = F.

Course Outline:
Topics of lecture, discussion, and research include: the physical environment and the distribution of life (planet earth, atmospheric composition/stratification, energy distribution, climate classification systems, vegetation classification systems), palaeoenvironments and species origins (major palaeoeological events, time frame for vertebrate and invertebrate evolution, individual species origin research), biological diversity (habitat, genetic, species diversity), biogeographic subdivisions (communities, ecoregions, biomes), biological interactions (food chain, symbiosis), dispersal and colonization (passive and active dispersal, chores, irruptions, population growth, biological invaders), speciation and extinction (temporal patterns, vicariance, trophic cascades, threatened/endangered), and disturbance and conservation.

Text: Not required

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Civility in the Classroom
“Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.”

Observance of Holy Days
"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.
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BIOGEOGRAPHY (Advanced Physical Geography)
GEOG 5304-001     Spring 2011
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Holden Hall 221

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Office Location:  Holden Hall 217
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Self Assessment
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Grading:
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Text: Not required

Additional Notes:
This course is piggy-backed with the undergraduate Biogeography course. Requirements will differ for graduate students in the following manner: 1) Graduate students are expected to lead course focus groups and in-class discussion regarding specific topics and reading assignments (this includes creating Power Points), 2) Graduate students will be expected to be more thorough when conducting literature reviews, and 4) Graduate students will be expected to bring in, and share, relevant and rigorous news on biogeographic topics.

Additional Policies:
Academic Integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. "Scholastic dishonesty" includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Civility in the Classroom: "Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class."

Observance of Holy Days: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should
make that intention known in writing to the instructor prior to the absence.

*Students with Disabilities:* Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor at tina.delahunty@itu.edu or 742-2466 x 250 as soon as possible to request necessary accommodations. Students should present appropriate verification from Student Disability Services (AccessTECH).
Instructor: Gary S. Elbow  
Office: ADM 104 B & McClellan 214  
Phone: 742-2184  
E-mail: gary.elbow@ttu.edu  
Hours: MWF 8:00-9:00, T After class

Course description

This course deals with free trade in the Americas, including the NAFTA agreements (which went into effect on January 1, 1994), MERCOSUR (the free trade area of Argentina, Brazil, Chile, Paraguay, and Uruguay), FTAA (Free Trade Agreement of the Americas), CAFTA (Central America/Dominican Republic Free Trade Agreement) and several older trade associations such as CACM and the Andean Pact. The principal focus of the course is on NAFTA.

The NAFTA Agreements, which are actually a series of bi-lateral agreements between Mexico and the United States and Mexico and Canada, were intended to eliminate over time barriers to trade among the three largest nations of the North American continent. Proponents of NAFTA argued they would open up trade among the three participating countries and stimulate their economies. They were convinced that NAFTA would bring Mexico into "developed nation" status, reduce unemployment, and increase salaries. For the United States and Canada, the NAFTA agreements would open up a vast new market (over 100 million Mexican consumers) and, in the case of the United States, provide access to Mexico's vast natural resource base, especially petroleum and natural gas. The opponents believed that NAFTA would transfer jobs from the United States and Canada to Mexico, create greater dependency on the part of the more developed partners in the agreements, and increase U.S. control of the Mexican economy. In this course we will look at NAFTA after 15 years and assess the impacts it has had in the three participating countries.

MERCOSUR was intended to provide benefits similar to NAFTA for countries of the Southern Cone. From the Brazilian perspective, it was also intended to extend that country's influence in the region. This was part of a long-range geopolitical strategy to install Brazil as the hegemon of the continent. We will also examine MERCOSUR to see how it differs from NAFTA and also to learn how effective it has been at achieving its stated goals.

Learning Outcomes

Students can outline the general economic history in the twentieth century of North America and Latin America. Students are able to describe the political and economic climate that contributed to development of FTA's with specific reference to NAFTA.

Students are able to explain the process of globalization and are prepared to discuss the political and economic situation in North America and Latin America that created a climate in which free trade became a viable economic and political alternative.

Students are able to identify major differences in the socio-economic and political structure of the member countries of NAFTA and MERCOSUR.

Students can differentiate among customs union, free trade agreement, integration agreement, and political union.

Students understand the basic framework of the NAFTA, MERCOSUR, and earlier free trade agreements.

Students are able to write accurate essays on the positive and negative impacts of NAFTA and MERCOSUR after 10 years and 6 years, respectively.

Books available for purchase at local bookstores


Gary Clude Hufbauer & Jeffrey J. Schott, NAFTA Revisited: Achievements and Challenges, Institute for International Economics, 2005
Course outline

January 13  Introduction
January 19  Defining Terms: Globalization, Free Trade (Read Russell, The Choice)
January 21  Comparative advantage and free trade (Russell, The Choice)
January 26  Comparative Advantage and Free Trade (Russell, The Choice)
January 28  Overview of Latin American Economic History (Handout)
February 2  U. S. Relations with Mexico and Canada (Handouts)
February 4  NAFTA Overview (NAFTA Revisited, Ch. 1 (pp 1-78)
February 9  NAFTA Overview (NAFTA Revisited, Ch. 1 (pp 1-78)
February 11 First Exam
February 16 Side Agreement on Labor (NAFTA Revisited, Ch. 2, pp. 79-152)
February 18 Side Agreement on Labor (NAFTA Revisited, Ch. 2, pp. 79-152)
February 23 Side Agreement on Environment (NAFTA Revisited, Ch. 3, pp. 153-198)
February 25 Side Agreement on Environment (NAFTA Revisited, Ch. 3, pp. 153-198)
March 2  Dispute Settlement Processes (NAFTA Revisited, Ch. 4, pp. 199-282)
March 4  Dispute Settlement Cases (NAFTA Revisited, Ch. 4, pp. 199-282)
March 9  Second Exam
March 11 Agricultural Trade (NAFTA Revisited, Ch. 5, pp. 283-363)
March 13-21 Spring Break
March 23 Agricultural Trade (NAFTA Revisited, Ch. 5, pp. 283-363)
March 25 Automotive Trade (NAFTS Revisited, Ch. 6, pp. 365-393)
March 29 Automotive Trade (NAFTA Revisited, Ch. 6, pp. 365-393)
April 1  Energy (NAFTA Revisited, Ch. 7, pp. 395-439)
April 6  Energy (NAFTA Revisited, Ch. 7, pp. 395-439)
April 8  Migration (NAFTA Revisited, Ch. 8, pp. 441-466)
April 13 Migration (NAFTA Revisited, Ch. 8, pp. 441-466)
April 15 Recommendations (NAFTA Revisited, Ch. 9, pp. 467-492)
April 20  FTAA, MERCOSUR, Andean Pact and ACS (Handouts)
April 22  FTAA, MERCOSUR, Andean Pact, and ACS (Handouts)
April 27  Reports (All term papers are due on this date)
April 29  Reports
May 4  Reports

Please note: This course deals with current content and is discussion oriented. Therefore, the course outline is subject to change depending on the flow of class discussion and on relevant events that may take place during the course of the semester.

Evaluation procedure

Your grade will be based on the results of three examinations, a 2000-word team-prepared term paper and PowerPoint presentation, and class participation. The examinations will be worth 100 points each, the paper and PowerPoint presentation is worth 150 points, and class participation counts 50 points. Each examination will consist of several short essay questions and terms to define. Class participation means coming to class regularly and participating in the various class activities. Roll will be taken each day. Term paper instructions are below.

During class we will discuss issues from the readings at considerable length. Therefore, it will be important for you to do the readings before class, to attend all classes, and to be prepared to participate in discussions.

Make-up examinations will be allowed only for students with a valid excuse for having missed the exam. A valid excuse includes but is not limited to illness, family emergency, religious holiday, and travel away from Lubbock for a university-sanctioned activity. Other excuses for missing an exam will be evaluated on their merit. Please inform me ahead of time if your absence can be anticipated. For illness or emergency, please contact me as soon as possible after the fact to schedule a make-up exam.

Examinations are essay-type and consist of two kinds of items: identifications (5 points each) and short essays (15 points each). Generally, I will include a larger number of identifications and essay questions on an exam than you will be required to answer. This allows students a limited amount of choice in what items they choose to answer.

The final examination is not comprehensive. It deals only with material covered between March 11 and May 4.

Term Paper Instructions:

All students are required to write a team-prepared term paper. The teams will be comprised of 2 or 3 students each, depending on the final enrollment number in the class. I will organize the teams but if there is someone with whom you especially wish to work, please let me know and I will try to accommodate you. I will also assign the topic of the team presentation. Topics will be assigned during the second week of class.

The paper and presentation should be based on research of the literature on the topic. You should be able to find information in books, journals, trade magazines and newspaper articles and on line. I will be glad to work with you if you need some help. A standard citation form should be used for literature references in the paper, but I do not care which form you use as long as it is used consistently throughout the paper. The PowerPoint presentations should be 20 minutes long. Term papers are due on the first of the three days dedicated to reports at the end of the semester, April 27.

Accommodation for Disabled Students:

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course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405

**Student Absence for Observation of Religious Holy Days**

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**Academic Integrity (TTU O.P. 34.12)**

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Cheating of any form, but especially plagiarism (i.e., the representation of someone else’s work or ideas as your own) will be dealt with harshly. At a minimum, the offending essay will receive a grade of 0, which will be averaged into your overall grade. Flagrant or repeated cases of plagiarism may result in a grade of F for the course. All cases of cheating will be reported to the appropriate academic dean and to the Honors College dean, who may take additional disciplinary action as they see fit.
Instructor: Gary S. Elbow
Office: ADM 104 B & McClellan 214
Phone: 742-2184
E-mail: gary.elbow@ttu.edu
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Books available for purchase at local bookstores


Gary Clyde Hufbauer & Jeffrey J. Schott, NAFTA Revisited: Achievements and Challenges, Institute for International Economics, 2005
Readings to be distributed in class on CD:


Course outline

January 13  Introduction
January 19  Defining Terms: Globalization, Free Trade (Russell, The Choice)
January 21  Comparative advantage and free trade (Russell, The Choice)
January 26  Comparative Advantage and Free Trade (Dicken, Trading Worlds)
January 28  Overview of Latin American Economic History (Bromley & Bromley, Dependent Industrialization)
February 2  U.S. Relations with Mexico and Canada (Handouts)
February 4  NAFTA Overview (NAFTA Revisited, Ch. 1 (pp 1-78; Morales, Post-NAFTA North America)
February 9  NAFTA Overview (NAFTA Revisited, Ch. 1 (pp 1-78)
February 11  First Exam
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March 4    Dispute Settlement Cases (NAFTA Revisited, Ch. 4, pp. 199-282)
March 9    Second Exam
March 11   Agricultural Trade (NAFTA Revisited, Ch. 5, pp. 283-363; Aragon, Fouquet & Campos, Emergence of Successful Export Activities in Mexico)
March 13-21 Spring Break
March 23   Agricultural Trade (NAFTA Revisited, Ch. 5, pp. 283-363; Wise, Agricultural Dumping)
March 25   Automotive Trade (NAFTS Revisited, Ch. 6, pp. 365-393)
March 29   Automotive Trade (NAFTA Revisited, Ch. 6, pp. 365-393)
April 1    Energy (NAFTA Revisited, Ch. 7, pp. 395-439)
April 6    Energy (NAFTA Revisited, Ch. 7, pp. 395-439)
April 8    Migration (NAFTA Revisited, Ch. 8, pp. 441-466; Lowenstein, The Immigration Equation)
April 13   Migration (NAFTA Revisited, Ch. 8, pp. 441-466; Singleton, Not Our Borders)
April 15   Recommendations (NAFTA Revisited, Ch. 9, pp. 467-492; Zepeida, Wise & Gallagher, Rethinking Trade Policy)
April 20   FTAA, MERCOSUR, Andean Pact and ACS (Handouts; Devlin & Estevadeordal, What's New in the New Regionalism?)
April 22   FTAA, MERCOSUR, Andean Pact, and ACS (Handout; Elbow, Regional Cooperation in the Caribbean)
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The paper and presentation should be based on research of the literature on the topic. You should be able to find information in books, journals, trade magazines and newspaper articles and on line. I will be glad to work with you if you need some help. A standard citation form should be used for literature references in the paper, but I do not care which form you use as long as it is used consistently throughout the paper. The PowerPoint presentations should be 30 minutes long. Term papers are due on the first of the three days dedicated to reports at the end of the semester, April 27.

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Syllabus Geol. 3310 and 5310; Quantitative Methods in Geology; TR 2:00-3:20 PM

Prof: Gurrola
Office: 311, phone: 742-3299; Cell: 577-6848; email: harold.gurrola@ttu.edu
Hours: by arrangement, my hours never match yours so email me or call for an appointment.
Book: No book is required.

Objective:
The objective of this course is to gain an understanding of basic statistical data analysis and display of data on computers. This class will include methods to analyze and display 1-D, 2-D and 3-D data. Emphasis will be to learn basic data manipulation in excel and Matlab.

Subjects will include:
Microsoft Excel: including the use of equations, logical statements, plotting and statistical tools.
Matlab: including the use of Matlab as a “powerful calculator” and as a programming language.
Plotting data
Basic statistical description of data
Error and precision of data
Matrix algebra
Regression
Interpolation and extrapolation
Basic inversion theory
Time series analysis

Grading:
Grades will be based on accumulated points summing to 1000 by the following categories:
Homework (500 undergraduates, 400 graduate students): There will be regular homework problems that will include computer projects. Group discussion of homework is expected but each student should only turn in work that they complete and understand. Your understanding of new material is dependent on completing previous work as a result late homework will not be accepted without prior arrangements.
Project (100 graduate students only): Each graduate student will pick some aspect of their proposed thesis work that lend itself to statistical or other computer analysis and present it to the class. The presentation will include a discussion of the geologic problem and the numerical method applied to the problem.
Pop quizzes (200): These will be closely related to the material covered in the homework assignments. These quizzes will be given on the day the homework assignments are due. These will be in the style of the final exam questions and cumulatively serve in place of a midterm exam.
Mid-Term Exam and Final Exam (300; 150 pts each): The test may be taken from the homework or lectures. Collaborative efforts are not allowed in the event of a take home test.
Grading scale:
A+ >= 970, A+ >= 930, A >= 900, B+ >= 870, B >= 830, B- >= 800, C+ >= 750, C >= 700, C- >= 650, D >= 550, less than 550 will be an F
Expected Learning Outcome
1) The student will develop skills to use computers to display data in 1-D, 2-D and 3-D plots.
2) Students will develop will understand basic statistical methods to describe data. Emphasis in this regard will be on an understanding of the statistical tool and on how to use these methods in excel and Matlab.
3) The students will be able to use matrix inversion to perform regression of data.
4) The students will be able to use excel to plot and analyze data.
5) They will learn to write basic code in Matlab to more efficiently process and display data.

Assessment
1) A test will be given on the first day of class. This test will be repeated at the end of the semester to determine if the students accomplished the goals of the class. The questions will be broken up by subject matter to determine what material was adequately covered and what needs further development.
2) Regular homework assignments will be given that are designed to expand the student's knowledge of the vocabulary involved in data analysis. I will identify problems in the understanding of the material when grading the homework and use class discussion to correct short comings or misunderstanding.
3) Pop quizzes will be given on the day certain homework assignments are turned in. The quizzes will give the instructor the opportunity to determine how well the students retain the information from homework. The material from the quizzes will be summarized by the instructor after the quiz and will be the subject of class discussion.

Absences:
While role is not taken absences on days with a quiz or test will not be excused except due to illness (with doctor note), official approved trips and religious observances. In accordance with Texas Tech Catalogue prior notification of such absences will be required.

Special Arrangements:
Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact the professor at the beginning of the semester so that accommodations can be made. Student must typically register with Student Disability Services.
ADVANCED PETROPHYSICS [GEOL 5399]
Dr. Asquith 9.30-10:50 Tu-Th Rm 225 Science Building
Office Hours: 8:00-10:00 MWF Rm 332
SPRING 2011
TWO EXAMS 50% EACH NO FINAL

SHALE RESERVOIRS [new this semester]
1.) Determination of Volume of Clay, Total Porosity, and Effective Porosity
2.) Determination of Adsorbed Content, Gas-Filled Porosity, and Free Gas Content
3.) Determination of Permeability
4.) Conversion Total Gas Content from SCF/TON to BCF/SEC

CARBONATES
1.) INTRODUCTION
2.) RESISTIVITY LOGGING SUITE THROUGH TIME
3.) WHY KNOWLEDGE OF PORE TYPE IS IMPORTANT
4.) REVIEW OF BASIC WELL LOGGING METHODS
5.) LITHOLOGY FROM WELL LOGS
6.) FLOW CHART FOR CARBONATE WELL LOG ANALYSIS
7.) ADDITIONAL LOG ANALYSIS METHODS
   Single Textural Parameter “W” for Bimodal Porosity Reservoirs
   Water Saturation using the Lucia (1995) Method
   Low Porosity “m” Method
   Determination of “m” Exponent for Vuggy Reservoirs
   Determination of “n” Exponent
   Variations in “n” Saturation Exponent
8.) THE DEW PLOT [carbonates]
9.) EXAMPLE PROBLEMS [1 THROUGH 11]

SANDSTONES AND SHALY SANDSTONES
1.) ARCHIE EQUATION
2.) REVIEW OF RATIO METHODS
3.) SANDSTONE AND SHALY SANDSTONE FLOW CHART
4.) DEW PLOT [sandstones & shaly sandstones]
   Example
5.) INTRODUCTION TO SHALY SAND ANALYSIS
6.) Rw FROM SP IN SHALY SANDS
7.) OUR GOALS
   Effective Porosity
   Effective Water Saturation
8.) NATURE OF SHALE AND CLAY
9.) QUICK-LOOK METHODS
10.) EXAMPLE OF SHALY SAND ANALYSIS
    Basic Calculations
Vcl Determination and Porosity Log Correction for Vcl

Q – Plot

Determination of Effective Water Saturation

Vcl Based Method

Non-Vcl Based Methods

LEARNING OUT COMES:

1.) For the carbonate part of the course the students should be able to differentiate carbonate pore type (i.e. intergranular/intercrystalline, Bimodal intergranular + intragranular microporosity, or Vuggy), if the carbonate is water-wet or oil-wet, and is the carbonate potentially hydrocarbon productive.

2.) With pore type and the reservoirs wetting phase determined the student will be able to select the appropriate strategy for determining the correct water saturation for the reservoir.

3.) For the sandstone - shaly sandstone part of the course the student will be able to differentiate whether the sandstone reservoir is a sandstone or a shaly sandstone that is potentially hydrocarbon productive.

4.) If the reservoir is a shaly sandstone the student will be able to determine the volume of clay (Vcl), corrected the porosity logs for the Vcl, and correct the total water saturation to effect water saturations using a multitude of shaly sand equation depending on the type of reservoir.

ASSESSMENTS:

In order to assess how well the student have learned the subject eleven carbonate example and 10 sandstone examples will be worked in class. These examples are in addition to the two one hour exams.

ANY STUDENT WHO, BECAUSE OF A DISABLING CONDITION, MAY REQUIRE SOME SPECIAL ARRANGEMENTS IN ORDER TO MEET COURSE REQUIREMENTS SHOULD CONTACT THE INSTRUCTOR AS SOON AS POSSIBLE TO MAKE NECESSARY ARRANGEMENTS. STUDENTS SHOULD PRESENT APPROPRIATE VERIFICATION FROM THE DISABLEED STUDENT SERVICES OR DEAN OF STUDENTS OFFICE. NO REQUIREMENT EXISTS THAT CAN ACCOMMODATIONS BE MADE PRIOR TO COMPLETION OF THIS APPROVED UNIVERSITY PROCESS.

EXCUSED ABSENCES FOR RELIGIOUS DAYS FOR STUDENTS:

Amendment to section 4.4 of Board rules-the amendment implements a change mandated by House Bill 256 of the 76th Legislature. The amendment removes a requirement that a student must notify his or her instructor in advance of any absence for the purpose of observing a religious holy day. Students will no longer be required to notify their instructors in advance regarding such absences. House Bill 256 also
requires that a student shall be excused from attending classes or other required activities, including examinations, during time needed for travel for the purpose of the observance of a religious holy day, and it includes a provision for the resolution of any disputes that could arise regarding the nature of an absence under this section, or the provision for a reasonable time in which to make up the work that was missed during such an absence.
Advanced Structural Geology • Spring 2011 • GEOL 4361/5361
Monday & Wednesday 12:30-2 PM, room 201 and 225.

Deformation Mechanisms & Rheology from the Mountain to the Microscope

Professor Aaron Yoshinobu, Geosciences Department Room 231, 742-4025, aaron.yoshinobu@ttu.edu

Course Objectives

1. Distinguish deformation mechanisms at various scales in naturally and experimentally deformed materials.
2. Apply structural techniques & scientific methodologies to evaluate complex deformation fields.
3. Develop modern communication skills including writing, graphic/illustration development, and presentation to convey your structural findings and understanding.

Course Prerequisites Courses in Structural Geology, Field methods, tectonics, solid earth geophysics, and optical mineralogy are required.

Field Trip Manzano Mountains, New Mexico. Graduate students will be required to participate on field trips to the southern Manzano Mountains where geological mapping and sampling will be undertaken to evaluate multiple deformation episodes in a Proterozoic terrane. Undergraduate students are strongly urged to participate. FIELD TRIP DATE TO BE ANNOUNCED.

Texts & Reading Materials There are no required readings. However, I urge you to invest in these books. Most importantly Microtectonics by Passcheir and Trouw and A Practical Guide... by Vernon.

Microtectonics (2nd Edition) by Passcheir, C.W. and Trouw, R.A.J.
Rheology and Deformation of the Lithosphere at Continental Margins edited by Karner, G.D. et al.
Structural Geology (2nd Edition) by Twiss and Moores — good background on deformation mechanisms, rheology, stress, strain.
Structural Geology of Rocks and Regions (2nd Edition) by Davis and Reynolds.
Structural Geology by Haakon Fessen — very well illustrated.
Structural Analysis of Metamorphic Tectonites by Turner and Weiss — anuzzer classic!

In addition to textbook reading various papers from the geologic literature will be assigned. Readings are required and students will be called upon to explain definitions, illustrations, assumptions, and to critically evaluate the scientific content.

Required Materials for Every Class Meeting Compass, protractor, metric/American ruler, pencils, colored pencils, calculator, hand lens, tracing paper.

Grading & Assessment Undergraduate students (GEOL 4361) will be graded on a separate scale and have different requirements than graduate students enrolled in GEOL 5361. In general, I assign grades based on student involvement over the course of the semester, recognized improvement in work, as well as the traditional methods including:

Approximately 10 Laboratory Exercises, Multiple Quizzes/Exercises, One Midterm, One Final Exam*, Final Project, Multiple Class Presentations; A = 100-90%, B = 80 - < 90%, C = 70% - < 80%, D = 60% - < 70%, F = < 60%.
The final will be optional at the discretion of the Professor based on class participation, performance on various assessments, student attitude toward learning, and other variables. In other words, if the class collectively performs well over the course of the semester, then there will be no final. If a few students do not show adequate progress over the course of the semester, there will be a final.

Additional Needs

Those with learning disabilities or who require some special arrangements in lecture should see me ASAP. Proof of the particular disability or condition must be furnished. The P.A.S.S. office in West Hall is available for special testing or studying services and counseling. Students may be excused from class for observance of a recognized religious holiday.

Absences and late assignments will not be excused unless the Professor/TA is given PRIOR notice (i.e., excused absence from University Administrator, etc.) or is provided with adequate explanation of the absence (i.e., Drs. note, etc.). Late assignments will be docked 2 points/day after the due date. Students shall be excused from attending classes or other required activities, including exams, during time needed for travel for the purpose of the observance of a religious holy day.

Those with learning disabilities or who require some special arrangements in lecture should see me ASAP. Proof of the particular disability or condition must be furnished. The P.A.S.S. office in West Hall is available for special testing or studying services and counseling. Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

Advanced Structural Geology • Spring 2011 • Schedule

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>LABS/Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, methods of observation,</td>
<td>LAB 1 Hand samples</td>
</tr>
<tr>
<td>scale, geometry</td>
<td></td>
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<tr>
<td>Rheology, Deformation &amp; Flow</td>
<td>LAB 2 Symmetry &amp; thin sections</td>
</tr>
<tr>
<td>Strain</td>
<td>LAB 3</td>
</tr>
<tr>
<td>Brittle Deformation</td>
<td>LAB 4</td>
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<tr>
<td>Semi-brittle Deformation</td>
<td>LAB 5</td>
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<tr>
<td>Plasticity</td>
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<tr>
<td>Dislocation Glide</td>
<td>LAB 6</td>
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<tr>
<td>Dislocation Creep</td>
<td>LAB 7</td>
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<tr>
<td>Recrystallization</td>
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<tr>
<td>Diffusion Creep</td>
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<tr>
<td>Kinematics</td>
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<tr>
<td>Porphyroblast-matrix Relationships</td>
<td>LAB 8</td>
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<tr>
<td>Fabrics in Igneous Rocks</td>
<td>LAB 9</td>
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<tr>
<td>Fault-stress inversions</td>
<td>LAB 10</td>
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<tr>
<td></td>
<td>Exercise</td>
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GUEST SPEAKERS
Dr. Mike Williams, University of Mass., Amherst 18 February
Dr. Bob Miller, San Jose State Univ. 15 April
Syllabus GPH. 5300 and 4300; seismology; MWF 10:00-11:00

Prof: Gurrola; Office: 311, phone: 742-3299; Cell: 577-6848;
email: harold.gurrola@ttu.edu
hours: by arrangement, my hours never match yours so email me or call for an appointment.
Book: Introduction to Seismology by Peter Shearer (I would buy this one but it is up to you, ~$50 on Amazon), The Solid Earth, an introduction to geophysics, by C. M. R. Fowler

Course Description
This class will be a discussion of Earth structure with emphasis on passive seismic methods. We will cover the basic theory behind seismology and applications most relevant to the student’s research. There will be a lecture component and a seminar component. The seminar component will focus on theory and application closely related to the students thesis or research projects.

Topics:
The mathematical description of stress and strain.
The wave equation.
Body waves
Surface waves
Earthquakes
Research specific topics

Grading:
Grades will be based on the following categories:
Homework: There will be regular homework. Students will present their homework problems in class as part of their participation grade.
Presentations: Each student will be responsible for presentation based on literature review of material related to their thesis.
Class participation (600): Students will be expected to participate in the seminar discussions and homework presentation.
Midterm (200): This will be a take home and oral test used to assess learning outcomes.
Final Exam (200): This will be a take home and oral test used to assess learning outcomes.
Grading scale:
A+ ≥ 970, A ≥ 930, A- ≥ 900, B+ ≥ 870, B ≥ 830, B- ≥ 800, C+ ≥ 770, C ≥ 730, C- ≥ 700, D+ ≥ 670, D ≥ 630, D- ≥ 600, less than 600 will be an F

Expected Learning outcomes
Upon completion of the course the students will be able to:
1) Understand the wave equation.
2) Understand how different earthquake based seismic methods are used to study the Earth
3) Understand and use seismic methods as part of their research.
4) Read and be able to critique seismological literature.

Methods of assessing outcomes
1) Evaluating progress in homework. Homework will be presented in class. Class discussion will therefore provide a continual assessment of the level of understanding and retention of material covered in the homework.

2) The seminar component will consist of student review of literature of concepts related to their research topics. This will provide a means to judge how well students are able to take theoretical concepts from class and apply them to real research.

3) Individual meetings. I will from time to time meet with students individually to help them prepare their seminar presentations or discuss their previous presentations. This will help determine how well they are developing the ability to take class room concepts and apply them to research.
Instructor: Perry Carter
Holden 210
(806) 742-2466 ext. 251
perry.carter@ttu.edu

Office Hours: Tuesday, 10-11; 2:30-3:30

Course Summary:
This course is designed as a survey of issues in urban geography. Because urban geography's focus is the city (a place) rather than a particular topic the course covers a range of topics relevant to cities - politics, economics, culture, gender, ethnicity, urban migration, residential spaces, retail location, urban form, ... Because all these issues co-exist and interact in one place - the city - the primary aim of this course will be to understand the linkages among the many topics we study. Simply, we want to understand the city as a whole rather than understand specific parts of the city in isolation (its economy, its politics, its culture, etc.).

Urban geography takes a spatial approach to understanding cities, and urban geographers want to know where things are, why they are there, and why their location is important. Moreover, they are interested in spatial patterns in the city - they attempt to describe and explain the city's spatial layout. This spatial approach to cities - an approach that strives to understand how people and culture and power and relationships are embedded within the spaces of the city - is the defining feature of urban geography.

This urban geography will be explored using two specific urban examples - Los Angeles and Lubbock. By reading about Los Angeles and going out and studying Lubbock, students will get a better understanding of how to critically (to carefully analyze and interpret) urban landscapes. A secondary goal of this course is to develop students' writing skills. To further this goal, students will write a 10 page paper have to do with the city of Lubbock.

Required Texts:
The Los Angeles River: Its Life, Death, and Possible Rebirth by Blake Gumprecht
Bound for Freedom: Black Los Angeles in Jim Crow America by Douglas Flamming
My Blue Heaven: Life and Politics in the Working-Class Suburbs of Los Angeles, 1920-1965 by Becky Nicolaides
Inventing Autopic Dreams and Visions of the Modern Metropolis in Jazz Age Los Angeles by Jeremiah B.C. Axelrod
Fit to be Citizens?: Public Health and Race in Los Angeles, 1879-1939 by Natalia Molina
Making the San Fernando Valley: Rural Landscapes, Urban Development, and White Privilege by Laura Barraclough

Americans with Disabilities Act:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for person with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you require special arrangements in order to meet course requirements, you should contact the instructor as soon as possible to make necessary accommodations. Students should present appropriate verification from Disabled Student Services, Dean of Students office.

Accommodation:
Accommodation will be provided for students that have a disability documented through Access Tech (Disabled Student Services). Accommodations are designed to enable students with disabilities to perform on an equal basis with their peers. If you have been recommended for an accommodation, you should take advantage of this leveling opportunity by contacting the professor early in the semester. Any exams taken without notifying the professor of a disability will stand as recorded. Access Tech is located at 247 West Hall (806) 742-2405. Accommodation can apply to permanent disabilities or to temporary injuries as well (broken arms, surgery, etc.) If you need any special accommodation, please see the instructor during the first week of classes.
Course Goals

This Course has four goals:

1. The development of a spatial view of urban landscapes – the ability to see places as the products of certain economic, social, and cultural decisions and histories as well as locations which derive their meanings via their relationships with other places.

2. The cultivation of a practice of critical thinking – an agnostic and persistently questioning method of thought.

3. Provide students the opportunity to learn by researching.

4. Provide students the opportunity to think through writing – placing a stream of coherent thoughts on a page.

Student Learning Outcomes

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Activities</th>
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<tbody>
<tr>
<td>By the completion of this course student will:</td>
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<tr>
<td>1) Demonstrate an understanding of the spatial view</td>
<td>1) Final paper</td>
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<tr>
<td>2) Show an ability to learn by researching</td>
<td>2) Final paper</td>
</tr>
<tr>
<td>3) Manifest developing critical thinking and evaluative abilities.</td>
<td>3) Emailed questions and class discussion of the of readings</td>
</tr>
<tr>
<td>4) Exhibit a grasp of a variety of urban issues</td>
<td>4) Weekly quizzes and summaries, and class discussions</td>
</tr>
</tbody>
</table>

Assessment

Points are accumulated in this class based on your performance on the assessment activities outlined above. I expect you to take each one of these activities very seriously and to come to me if you are having problems or if you have any questions.

Grade Scale:
A 100 - 90 Exceptional performance
B 89 - 80 Satisfactory performance
C 79 - 70 In need of improvement
D 69 - 60 Unsatisfactory
F Less than 60 Unacceptable
Course Requirements

1. Starting the second week of class students must email to me (perry.carter@ttu.edu) three questions or points of interest they have found in that week's readings. All questions and comments must be meaningful and non-trivial (i.e. good questions and comments). There will be thirteen weeks of readings and each complete set of questions will be worth one point for a total of 13 points towards your final grade. Questions must be emailed to me by 5:00 PM Mondays for students to receive credit.

2. Starting the second week of class quizzes over the assigned readings will be given. There are thirteen weeks of readings and therefore thirteen quizzes each worth four points for a total of 52 towards your final grade.

3. This will be primarily a discussion based class, student participation is very important. Though I will not give you a grade per se for class participation I will note students' level of involvement in the class and it will be reflected in their final grade.

4. Students are to write a ten (10) page paper which Must be in the following format: 1) a cover page with the title of the paper and your name on it (not part of the 10 pages), 2) a bibliography containing all the sources cited in the text of your paper (not part of the 10 pages). You should cite at least 5 sources. 3) the text of your paper must be written in Times New Roman font 12 point (the font and point size used in this syllabus); the margins of the text must be 1 inch on all four sides; and the line spacing must be 1½. No matter how good your paper might be if you do not follow this format you will receive a zero on it and forfeit 22 points towards your final grade. Detail about the paper will be given in class. It is worth 22 points towards your final grade.

5. Graduate Students: The final paper will differentiate the graduate version of the class from the undergraduate. Graduate students will write a sixteen (not including references) page paper. The paper should be written as if it was going to be submitted for consideration of publication as Urban Geography (www.bellpub.com/ug/index.html), or the Journal of Cultural Geography (www.geog.okstate.edu/users /culture/culture.htm). Choose which journal is most appropriate for your paper and then go to "Information for Authors" section of the journal's web-page and read and follow your chosen journal's format.

Academic Honesty

Texas Tech's policy on academic and scholastic honesty states:

"It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension."

To be exact plagiarism includes presenting another person's words, ideas, or designs as your own without giving them appropriate credit. Anyone found to be guilty of plagiarism will receive a zero (0) on their plagiarized assignment. If you do have questions about how to research or reference sources, please let me know.

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<tbody>
<tr>
<td>Emailed questions:</td>
<td>11 worth 1 point each:</td>
<td>13 Points</td>
</tr>
<tr>
<td>Quizzes:</td>
<td>13 worth 4 points each:</td>
<td>65</td>
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<tr>
<td>Final Paper:</td>
<td>22</td>
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<td>Total</td>
<td>100</td>
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<td>Dates</td>
<td>Readings (chapters)</td>
<td>Quizzes</td>
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<td>9-6</td>
<td>Gumprecht-intro &amp; 1; Molina-intro &amp; 1</td>
<td>1</td>
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<tr>
<td>9-13</td>
<td>Gumprecht-2; Molina 2 &amp; 3</td>
<td>2</td>
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<td>9-20</td>
<td>Gumprecht-3; Molina; Flaming intro &amp; 1</td>
<td>3</td>
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<tr>
<td>9-27</td>
<td>Gumprecht-4; Flaming 2; Nicolaides-intro &amp; 1</td>
<td>4</td>
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<td>10-4</td>
<td>Gumprecht-5; Flaming 3; Nicolaides-2</td>
<td>5</td>
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<tr>
<td>10-11</td>
<td>Fall Break</td>
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<td>10-18</td>
<td>Flaming -4; Nicolaides-3 &amp; 4</td>
<td>6</td>
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<tr>
<td>10-25</td>
<td>Flaming -5; Nicolaides-5</td>
<td>7</td>
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<td>11-1</td>
<td>Flaming -6; Nicolaides-6</td>
<td>8</td>
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<tr>
<td>11-8</td>
<td>Axelrod intro-1; Barrclough intro-1</td>
<td>9</td>
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<tr>
<td>11-15</td>
<td>Axelrod 2; Barrclough 2</td>
<td>10</td>
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<td>11-22</td>
<td>Axelrod 3; Barrclough 3</td>
<td>11</td>
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<tr>
<td>11-29</td>
<td>Axelrod 4; Barrclough 4</td>
<td>12</td>
</tr>
<tr>
<td>12-6</td>
<td>Barrclough 5-6</td>
<td>13</td>
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</tbody>
</table>

12-12 Final Paper Due in my Office by 5:00

Reading Tip ➔ “Read 25 pages a day and you will be OK”

If you define the Los Angeles megalopolis broadly enough, which most people are unwilling to do, I live at one end of it.

I live in Ventura, shorthand for San Buenaventura. It’s a working-class oil town turned typical Southern California suburb, located where Highway 101 hits the ocean after a sixty-five mile trip north and west from downtown Los Angeles. L.A.’s sprawl has crept toward Ventura along the 101 Corridor across the fertile, flat soil of the Oxnard Plain. It’s blocked from moving farther because of the ocean and an imposing set of rugged hills up toward Santa Barbara known as the Rincon. In a very real sense, this is where L.A. ends.

Most of my neighbors, of course, don’t want to believe that we are part of Los Angeles. A lot of them moved to Ventura or thereabouts to register a vote with their feet on how they feel about L.A. The irony of this attitude is rich indeed. Geographically we are close. We watch L.A.’s television shows and listen to its radio stations. Economically we are linked, much more than we used to be in the oil boom days, when our strongest economic ties were to Bakersfield and Houston. And when something bad happens in L.A.—a fire, an earthquake, a riot—our friends and relatives call to make sure we are okay. Our response is usually that everything is fine because we don’t really live there. We have decided that we live somewhere else.

It should have come as no surprise to me, then, to learn that the people at the other end feel pretty much the same way.

I remember the day I found the other end. It was a moody, rainy morning in the spring of 1990, and I braved the freeways for three-plus hours in my thirteen-year-old Honda Civic to go to Moreno Valley in Riverside County. Skidding across the wet lanes of the freeway—Southern Californians are terrible wet-weather drivers, treating every rainstorm as if it were a blizzard—I traveled through suburb after suburb, past shopping center after shopping center and tract after tract. Camarillo, Calabasas, Woodland Hills, Sherman Oaks, Studio City, Glendale, Pasadena, Duarte, San Dimas, Pomona, Corona. The suburban monotony was so continuous that it was numbing.

Then, after a hundred and thirty miles, I stopped and saw a meadow. Rich and green from the spring rains, hard up against the San Jacinto Mountains, this was obviously the edge of town. Roads trailed off into ruts. Houses had ramshackle look, with old tools and cars in the yards. Retail establishments were made of cinder blocks. Of course, there are more towns past the mountains: Banning, Beaumont, Palm Springs. But nothing else I had seen that day conveyed quite the same sense of termination.

It had taken almost half a day, and I had covered a distance that would have taken me through three or four Northeastern states, but I had finally found the other end of Los Angeles. And as I traveled around Moreno Valley that day, the people I talked to felt as much alienation from Los Angeles as my neighbors in Ventura.

From William Fulton’s
The Reluctant Metropolis
2001
ENVIRONMENTAL CHANGE
GEOG 3310-001     Spring 2012
Tuesday and Thursday 12:10 - 1:50 pm
Holden Hall 221

Professor:     Dr. Tina Delahunty
Office Location:  Holden Hall 217
Office Hours:   Tuesday and Thursday 3:30-4:50
                Feel free to stop by or call/email to set up another time
Email:         tina.delahunty@ttu.edu (Be sure to enter Enviro on the subject line)

Catalog Description:
Prerequisite: GEOG 1401 or equivalent natural science course. Investigates changes in climate, hydrology, soils, biota and landforms, and the effects of these environmental changes on humans.

Further Description:
The main purpose of this course is to provide an opportunity to understand and assess the changes in Earth's biosphere and atmosphere through geologic time. Students will discover, through the evaluation and discussion of lectures and literature, the vast and intricate environmental changes the Earth has experienced. Ultimately the student will acquire a better understanding of the dynamic nature of the current global environment. Students will research, discuss, and critique academic/refereed environmental change literature as well as popular press literature. Students will also compare and critique various global warming theories and relate these to their own well informed theories.

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Methods of Assessment Continued:
Student ability to reflect upon, explain, and discuss learned material largely determines the course grade received, so students must clearly demonstrate their knowledge, observations, critiques, etc. through the above assessments. Participation and noteworthy attendance are mandatory in order to perform well on classroom, individual, and collaborative projects.

Collaboration
In addition to the above assessments, student performance will be measured through peer evaluation. Several topics will be researched and discussed in groups. Upon completion of each collaborative project, peers will submit reports on the thoroughness and participation of individuals.

Grading:
Each questionnaire, free writing exercise, in class discussion/debate, concept map, peer evaluation, essay and power point will be worth 10 points (or in increments of 10 points). Each student's lowest grade on a 10 point assignment will be dropped at the end of the semester (this can be used to negate points lost because of an absence). At the end of the semester, all points will be added and the percentage of total possible points will determine the letter grade received. Letter grades will be based on the traditional grading scheme of 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 59% = F. There are no opportunities to make-up work (unless the absence is due to a university approved activity or formally documented medical issue (in either case documentation must be provided)). If a student misses a class, they should be sure to be prepared for the next class by discussing the missed material with other students and then the professor if necessary.

Course Outline:
Initial lectures will cover Earth’s physical characteristics, orbital variations, and an overview of geologic time. These will be followed by relating these to paleoclimate and paleobiology topics. Paleoclimate topics will include discussions of ocean circulation and sea level changes, carbon dioxide, methane, Cretaceous warmth, Cenozoic cooling, and continued discussions of tectonics, and orbital variations. Paleobiology discussions will focus on vertebrate and invertebrate life on Earth through geologic time and the use of isotopes, forams, diatoms, tree rings, and pollen in environmental change analysis. The class will conclude with informed discussions and debates about global warming.

Text References:
There is no specific required text, however, we will be exploring the following:
Williams, Martin et al. (1998). Quaternary Environments 2nd ed. Arnold.
Additional Policies:

*Academic Integrity*

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. “Scholastic dishonesty” includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

* Civility in the Classroom*

“Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.”


*Observance of Holy Days*

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.

*Students with Disabilities*

Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor at tina.delahunty@ttu.edu or 742-3102 as soon as possible to request necessary accommodations. Students should present appropriate verification from Student Disability Services (AccessTECH). No requirement exists that accommodations be made prior to completion of this approved university process.
ENVIROMENTAL CHANGE as Advanced Physical Geography
GEOG 5304-001 Spring 2012
Tuesday and Thursday 12 -1:50 pm
Holden Hall 221

Professor:     Dr. Tina Delahunty
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Collaboration
In addition to the above assessments, student performance will be measured through peer evaluation. Several topics will be researched and discussed in groups. Upon completion of each collaborative project, peers will submit reports on the thoroughness and participation of individuals.

Grading:
Each questionnaire, free writing exercise, in class discussion/debate, concept map, peer evaluation, essay and power point will be worth 10 points (or in increments of 10 points). Each student’s lowest grade on a 10 point assignment will be dropped at the end of the semester (this can be used to negate points lost because of an absence). At the end of the semester, all points will be added and the percentage of total possible points will determine the letter grade received. Letter grades will be based on the traditional grading scheme of 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 59% = F. There are no opportunities to make-up work (unless the absence is due to a university approved activity or formally documented medical issue (in either case documentation must be provided)). If a student misses a class, they should be sure to be prepared for the next class by discussing the missed material with other students and then the professor if necessary.

Course Outline:
Initial lectures will cover Earth’s physical characteristics, orbital variations, and an overview of geologic time. These will be followed by relating these to paleoclimate and paleobiology topics. Paleoclimate topics will include discussions of ocean circulation and sea level changes, carbon dioxide, methane, Cretaceous warmth, Cenozoic cooling, and continued discussions of tectonics, and orbital variations. Paleobiology discussions will focus on vertebrate and invertebrate life on Earth through geologic time and the use of isotopes, forams, diatoms, tree rings, and pollen in environmental change analysis. The class will conclude with informed discussions and debates about global warming.

Text References:
There is no specific required text, however, we will be exploring the following:
Williams, Martin et al. (1998). Quaternary Environments 2nd ed. Arnold.
Additional Policies:

Academic Integrity

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. “Scholastic dishonesty” includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Civility in the Classroom

“Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.”


Observance of Holy Days

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.

Students with Disabilities

Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor at tina.delahunty@ttu.edu or 742-3102 as soon as possible to request necessary accommodations. Students should present appropriate verification from Student Disability Services (AccessTECH). No requirement exists that accommodations be made prior to completion of this approved university process.
Geography 3350 / 5350: Social & Cultural Geography
Spring Semester 2014

Instructor: Perry Carter
Office: 210 Holden Hall
E-Mail: perry.carter.ttu.edu

Class Location: Holden Hall 111
Days: Tuesday
Time: 3:30-4:50 PM

Office Hours: Tuesdays and Wednesday 1:30-3:00 PM, or by appointment

Course Description:
This course examines how the social, cultural, economic, and historical actions and interactions of human beings create places. The course is designed for students who wish to investigate geography as a possible major, those who plan to teach geography in primary and secondary schools, those who need to fulfill a specific curriculum requirement, and those who simply wish to learn more about their world.

Why do certain regions have greater population problems than others? Why are some countries wealthier than others? What causes human movement between countries and regions? How does geography help us to understand conflict in the world? What exactly does it mean to be a developed country? How have people organized the earth's surface? What factors contribute to the creation of the landscapes in which we live? How do people derive their identities from the places that they inhabit? How does our location in the world influence how we view other locations and other people in those locations? These are a few of the questions that will be explored and discussed in this course.

This is a reading and writing intensive course whose main aim is to provide students a broad, yet at the same time, profound understanding of various societies and cultures using a spatial, geographic, perspective on human interaction with society, nature, and the built environment. The course will deal with spatial concepts such as landscapes, development, the environment, the economy, nationalism, colonialism and post-colonialism, migration, diasporas, globalization, urbanization, regionalization, and place. Students who complete this course will gain enhanced critical analytical thinking skills as well as enhanced writing skills. Such skills are of value not only in other academic endeavors but also in the world of work and in life in general.

Competency Statement for Multicultural Courses:
Students graduating from Texas Tech University should be able to demonstrate — awareness of knowledge of distinctive cultures or sub-cultures, including but not limited to: ethnicity, gender, class, political systems, religions, language, or human geography.

By the end of this course you should know and/or have an understanding of:

- Place Geography – the locations of countries and cities across the world
- How places and countries around the world are linked to each other economically, politically, and culturally
- The United States relationship to the larger world beyond its borders
- Critical thinking – actually thinking about what we think, feel, and believe
Americans with Disabilities Act:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for person with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you require special arrangements in order to meet course requirements, you should contact the instructor as soon as possible to make necessary accommodations. Students should present appropriate verification from Disabled Student Services, Dean of Students office.

Accommodation:
Accommodation will be provided for students that have a disability documented through Access Tech (Disabled Student Services). Accommodations are designed to enable students with disabilities to perform on an equal basis with their peers. If you have been recommended for an accommodation, you should take advantage of this leveling opportunity by contracting the professor early in the semester. Any exams taken without notifying the professor of a disability will stand as recorded. Access Tech is located at 247 West Hall (806) 742-2405. Accommodation can apply to permanent disabilities or to temporary injuries as well (broken arms, surgery, etc.) If you need any special accommodation, please see the instructor during the first week of classes.

Course Goals

This Course has three goals:

1. To acquaint students with places and cultures other than those of the United States and Europe.

2. The cultivation of a practice of critical thinking – an agnostic and persistently questioning method of thought.

3. Provide students the opportunity to think through writing – placing a stream of coherent thoughts on a page.

Student Learning Outcomes

Student Learning Outcomes
By the completion of this course student will:

1) Demonstrate an understanding Non-Western places and cultures.
   1) Weekly synopses

2) Manifest developing critical thinking abilities.
   2) Weekly quizzes

3) Exhibition of thinking through writing
   3) Four essays over the readings

Assessment

Points are accumulated in this class based your performance activities outlined above. I expect you to take each one of these activities very seriously and to come to me if you are having problems or if you have any questions.

Grade Scale:

A 100 – 90 Exceptional performance on the assessment
B 89 – 80 Satisfactory performance
C 79 – 70 In need of improvement
D 69 – 60 Unsatisfactory
F Less than 60 Unacceptable
Course Materials:
Required:  
*The Human Mosaic: A Cultural Approach to Human Geography*
by Domash, Neuman, Price, and Jordan-Bychkov

*Island Beneath the Sea* by Isabel Allende
*Americanah* by Chimamanda Ngozi Adichie
*Sweetness in the Belly* by Camilla Gibb
*Johnny Mad Dog* by Emmanuel Dongala

Other:  
A current world atlas with a good index. Atlases are available for in-house use only at the TTU library. Maps for the class assignments can be found at: [http://alliance.la.asu.edu/azga](http://alliance.la.asu.edu/azga)

Course Requirements:

1) Ten synopses of newscast will be due during the semester. Each synopsis is worth 1 points for a total of 10 points. You are to go to www.theworld.org and pick any news segment to listen to, or read, except “the Geo Quiz” and “the Geo Answer.” If you cannot find any that interest you for this broadcast of the show then view early broadcasts by going to the bottom of the page and clicking: “See more Stories.” Synopses must be composed of at least **100 words**. An example of a synopsis is below.

2) Because this is a reading intensive course it is of the greatest importance that students keep up with the readings. To encourage this every class will begin with a short quiz. There will be 10 quizzes with questions coming from the textbook, *The Human Mosaic*, as well as lectures and videos shown in class. Each quiz is worth 3 points for a total of 30 possible points. No make-up quizzes will be given.

3) There will be three (3) map tests during the course but only your best score out of the three will count. Below you will find a list of countries to know for the map exams. The map test is worth 20 points. No make-up quizzes will be given.

4) **The main focus of the class:** Essays are to be written on: *Island Beneath the Sea, Americanah, Sweetness in the Belly*, and *Johnny Mad Dog*. These essays should not be book reviews or book reports. Instead they should focus on the societies, cultures, and places depicted in these books. It is important that students make links, if they exist, between what they have learned in class and the places and situations that are described in the four books. A detailed essay guide will be handed out before the first essay is due. Each essay is worth 10 points for a total of 40 points.

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Grades: Quizzes over lecture and textbook  
Best Map Test  
Synopses  
**Essays**  
Total:  

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<td>79-70</td>
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<tr>
<td>D</td>
<td>69-60</td>
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Academic Honesty
Texas Tech’s policy on academic and scholastic honesty states:
“The attempt of students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension.”

Plagiarism includes presenting another person’s words, ideas, or designs as your own without giving them appropriate credit. Anyone found to be guilty of plagiarism will receive a zero (0) on their plagiarized assignment. If you do have questions about how to research or reference sources, please let me know.

SCHEDULE (subject to change at instructor’s discretion):

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<tr>
<th>Date</th>
<th>Domosh</th>
<th>Quizzes &amp; Tests</th>
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<td>12-May</td>
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<td>Jonny Mad Dog Essay Due in my Office before 5:00</td>
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Reading Rates:
To finish reading in time to write your essay you have to read:
24 pages a day of Island Beneath the Sea
15 pages a day of Americanah
14 pages a day of Sweetness in the Belly
14 pages a day of Johnny Mad Dog
Synopsis Example:

Student Name: Tamika Rosenberg

Malta divorce report (5:45)

Malta, a small European island nation in the Mediterranean Sea, has a 0 percent divorce rate (the United States has a 50% rate). This is because Malta is a traditional Catholic country where divorce is outlawed. Divorce being against the law has not made couple more faithful however. Extramarital affair affairs are common in Malta in part because people cannot get out of bad marriages. There are some exceptions to the no divorce law. Couples can partition to be legally separated but the process can be lengthy, sometimes as long as ten years, and once separated they can never re-marry. There is a move in the nation to get divorce legalized. The backers of the legislation argue that Malts is the only country in the European Union that does not allow divorce. (132 words)

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GEOGRAPHY 3352
GEOGRAPHY OF THE UNITED STATES AND CANADA

Spring Semester, 2014; 9:00-9:50 MWF; Room 225, Holden Hall

Instructor: Dr. Otis W. Templer
Office - Room 218, Holden Hall; (806) 834-4605, E-mail: otis.templer@itu.edu
Office Hours - 10:00-11:00 MWF or by appointment (or whenever the door is open)


<table>
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<th>Text Assignment</th>
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<td>Chaps. 1, 2, 4, 5, 6, 7, 8</td>
<td>Introduction</td>
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<td>North American Political Economy</td>
<td>Landforms, Drainage, and the Biosphere</td>
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<td>The Atlantic Periphery</td>
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<td>April</td>
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<td>4</td>
<td>EXAM NO. 2 (100 pts.)</td>
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<td>7</td>
<td>Chaps. 14, 15, 16, 17, 18, 19</td>
<td>MexAmerica</td>
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<td>California</td>
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<td>The Pacific Northwest</td>
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<td>16</td>
<td>Hawaii and the Pacific Islands</td>
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<td>18</td>
<td>The Far North</td>
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<td>The Future of North America</td>
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<td>May</td>
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GEOGRAPHY 3352

GEOGRAPHY OF THE UNITED STATES AND CANADA

COURSE OBJECTIVES, GRADING AND ATTENDANCE POLICY:

GEOG 3352, Geography of the United States and Canada, involves detailed study of the physical and human geography of this very diverse yet familiar world region. It focuses on the distinctive characteristics of various sub-regions of the United States and Canada. This course introduces students to a geographer’s perspective in studying and analyzing these regions. It provides familiarity with the region and skills that are especially important to students who either plan to or might eventually choose a teaching career.

GEOG 3352 can be used to satisfy three (3) credit hours from the Human and Regional Geography course block requirement for majors, and as a suitable upper-division course for minors. It is an approved course in the Secondary Education Teaching Field in Social Studies. It can partially fulfill the Individual and Group Behavior requirement in the College of Arts and Sciences. Also, it can serve as an appropriate upper-division elective course for any student interested in all or part of this important world region.

Your course grade will be determined primarily by your performance on three (3) examinations (100 pts. each) and a detailed trip itinerary (75 pts.) to some destination and its environs in the region. Thus, you can earn a possible 375 points in this course. Letter and numerical grades for each examination are as follows: A=87-100; B=77-86; C=67-76; D=57-66; F=<57. The final examination is non-comprehensive, covering only the lecture and assigned text readings following Exam No. 2. Graduating seniors who fulfill certain conditions (separate handout) may elect to exempt the final examination. Letter and numerical grades for the required trip itinerary are as follows: A=68-75; B=60-67; C=53-59; D=45-52; F=<45.

It is doubtful that any Geography majors will need to take this course for Writing Intensive (WI) credit, but if so you will not be expected to do a trip itinerary. Instead, you will receive separate instructions for three (3) WI assignments, two (2) very short papers (25 pts. each) and one longer paper (50 pts.) spaced at intervals through the semester. Therefore, WI students can earn a possible 100 points for the three papers, and a possible 400 points in the course. Letter and numerical grades for WI credit are as follows: A=90-100; B=80-89; C=70-79; D=60-69; F=<60.

In this course, a majority of the examination questions will be taken from material covered in class and lecture so regular attendance is very important. During my lengthy tenure at Texas Tech, until recently I never graded for attendance in my upper-division classes, assuming that more mature students have finally realized the very high correlation between good grades and good class attendance in most courses. In recent years, however, poor attendance by a few students sometimes resulted in very bad grades that, in turn, significantly lowered the class average. Therefore, I am instituting this attendance policy. Students who have more than ten (10) unexcused absences will have their final course grade lowered one full letter. For every ten (10) additional unexcused absences after that, the final course grade will be lowered another full letter. Attendance will be taken on a roll sheet circulated at each class meeting, so please remember to sign the roll each time you are present, and make sure you let me know of any excused absences.

Americans with Disabilities Act:

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Student Absence for Observation of Religious Holy Days:

A student who is absent from classes for the observation of a religious holy day shall be allowed to take an
TRIP ITINERARY INSTRUCTIONS:

Each of you will be responsible for planning and providing a written report on a trip itinerary to some destination and its environs in Anglo-America. Further, you must plan your trip to some destination where you haven’t lived previously or spent lengthy vacation time. Thus, most places in Texas and the American Southwest are probably off-limits to you. **This trip is to be a geographical exploration of one week (7 days) duration in the region (travel days to and from the area don’t count).** You are to plan this trip just as if you were actually going to go there and as if you had complete freedom to see and do anything you like, except for the constraint of practical realities. Your report should touch on most or all of the following:

Travel schedule:
- Most practical means of transportation
- Travel schedule (with time in each location)
- Most favorable time of year to visit

What to take with you:
- Necessary travel documents
- Appropriate clothing (for the climate and season)
- Inoculations, preventive medicine, etc.
- Useful specialized equipment

Places to visit and what you would expect to see and encounter, such as:
- Physical environment (climate, vegetation, wildlife, landforms, etc.)
- Unique cultural aspects (you should recognize at least a different subculture)
- Urban and rural environments and life styles
- Economic activities (industry, agriculture, mining, forestry, fishing, etc.)
- Notable scenic, cultural, or historic tourist sites
- Food and drink unique to the region or for which it is particularly noted

Any problems you might expect to encounter:
- Environmental problems such as air pollution, severe storms (hurricanes, tornadoes, lightning), earthquakes, tsunamis, noxious insects, poisonous snakes, etc.
- Travel arrangements, finding accommodations, etc.

You must have selected your travel destination by the class meeting on **Monday, February 17, 2014, and I must approve your proposed destination.**

It is my expectation that **your final report will be an eclectic regional geography of some small part of the United States or Canada.** Also, you should not expect to spend all your time in major cities, in tourist hotels, or at tourist sites. **Your trip should be planned so that you come away with some feel for and understanding of the region and its culture or subculture as a whole.** You might choose to incorporate participation in some favorite leisure activity in your itinerary (camping, hunting, fishing, skiing, rock climbing, bird watching, hiking, canoeing, bicycling, surfing, etc.).

You may consult any sources you wish for the necessary information, including, of course, the **Internet.** Good places to begin are travel guides, reference works, maps, or textbooks on the area. **Amazon.com** on the Internet lists hundreds, if not thousands, of relevant and current travel books and guides. What follows is a small sample of guides for Canada, New England, the Mid-Atlantic states, the South, the Midwest, the Pacific Northwest, Alaska, and Hawaii:

**Canada:**


**Hawaii:**


Also, it might prove useful to look through travel magazines such as *National Geographic, National Geographic Traveler, Travel and Leisure, Condé Nast Traveler, Travel/Holiday, Sunset, Southern Living*, etc. (most of which are indexed in *The Reader’s Guide to Periodical Literature*). If someone you know is a member of the American Automobile Association, you can request free *AAA Tour Books* of the region you are visiting, as well as maps of states and cities. These *AAA Tour Books* are always current and provide excellent information on things to see and do. Also, state and province tourist agencies often have sites on the Internet and many provide free tourist information on request.

The written reports should be approximately seven (7) to ten (10) pages in length, type-written, double-spaced, and with pages numbered. At the end of the report, you must cite the references you used, including Internet URL sites. Graduate students are expected to plan a lengthier trip, of two (2) weeks duration or to two (2) different regions. In special situations and with my approval, graduate students may elect to do a term paper rather than a trip itinerary.

The completed trip itinerary will be due at the class meeting Wednesday, April 23, 2014. No late trip itineraries will be accepted. I expect to keep one copy of the report. Therefore, if you wish to have the graded copy returned to you, please provide me with two (2) copies.
Geography 4301 Geomorphology in Environmental Management
Spring 2012
Dr. Jeff Lee
Office: Holden Hall 209a
jeff.lee@ttu.edu
Office Hours: MWF 10 to 10:50 or by appointment.

**Introduction:** Geomorphology is the study of landforms and the processes that create them. This course will concentrate on geomorphology and the interactions between people and geomorphological phenomena. A background in introductory earth science (e.g. physical geography or geosciences) is expected of all students, as is high school mathematics.

**Grading:** Grades for this course will be based on a scale of 270 possible points.

- Exams (3) 120 (40 each)
- Term paper 50 (35 for first draft, 15 for final draft)
- Class Presentation 10
- Research Project 50
- Lab 25
- Presentation 15

**Books:**

Additional readings will be assigned during the semester.

**Exams:** The tests involve essays dealing with course topics. The questions are given out approximately one week prior to the exam and the student is expected to write well-organized, thoroughly prepared and clearly written answers.

**Class Presentation:** Each student will present a topic (approved by the instructor) to the class in 10 to 15 minutes. It will be graded according to the content and the professionalism of the presentation.

**Term Paper:** The term paper is an important part of this course and should be approached accordingly. You will be given a list of references and you will write using those. Additional details will be provided on a separate handout.

The paper should be typed, double-spaced, and between 2000 and 3000 words (plus references and illustrations). The text should be concise, well written and corrected for typographical errors. The first draft will be graded by the instructor and returned to the student. The second draft will be graded as well.

**Research Project:** Each student will design and conduct an original research project on a topic approved by the instructor. Most will involve hypothesis testing though data collection and analysis, but other approaches to research are acceptable.
Laboratory
The lab portion of this course will emphasize techniques used in geomorphological research. Exercises will be done most weeks. There will be a lab project as well.

Course Outline
Topic __________________________ Reading (Gregory)
Introduction; Historical Development Ch 1, 2, 3
Systems
Wind p. 99-102; Ch. 9
Water p. 85-91
Mass wasting p. 77-85
Weathering p. 74-77
Karst
Glacial & periglacial p. 102-106; Ch. 7
Coasts p. 92-99
Management Ch. 11, 1
Presentations

Important Dates
Exam 1 15 February
Exam 2: 21 March
Exam 3 Monday, 14 May, 8:30 - 10AM
Term Paper due (first draft): 11 April
Term Paper due (final draft): 25 April
Lab Project due: end of semester

Learning Outcomes & Assessment (course based)
1. The student is expected to learn the basic principles of geomorphology and environmental management. This is assessed by essay examinations.

2. The student is expected to write clearly about geomorphology. This is assessed with the term paper, two essays and lab project write-up.

3. The student is expected to become skilled at conducting quantitative analyses of geomorphological information. This is assessed through in class projects and the lab project.

Learning Outcomes & Assessment
1. Students are expected to understand the major processes involved in landform formation and change. This will be assessed using a pre-test and post-test.
2. Students are expected to understand the basic techniques used in geomorphological research. This is assessed with the lab projects.
3. Students are expected to write well. This is assessed using essay exams, essays and the term paper.

Special Needs: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to
make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405. A student who is absent from classes for the observation of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence if, not later than the fifteenth day after the first day of the semester, the student had notified the instructor of each scheduled class that the student would be absent for a religious holy day.
Advanced Mineralogy and Crystal Chemistry (GEOL 5300-001/GEOL 4300-006)
Dr. Callum J. Hetherington
Sci. Building Rm 127
callum.hetherington@ttu.edu
Office Hours: By appointment
Lectures: Tuesday/Thursday 10:30-12:00, Science Building Rm. 201

This course will provide a comprehensive review of basic concepts in mineralogy and develop a practical understanding of advanced concepts in mineralogy, crystal chemistry and the methods that applied in modern research. The introduction will cover fundamental principles in mineralogy, crystallography and crystal chemistry.

**Learning outcomes.** At the end of the course, the student should:

1. Be familiar with nomenclature and terminology used in mineralogy and crystal chemistry.
2. Demonstrate an understanding of modern qualitative and quantitative techniques in mineralogy.
3. Predict the protolith, composition and metamorphic grade on the basis of petrography.
4. Be familiar with the most common structural features of non-silicate minerals.
5. Be familiar with the most common structural features of silicate minerals.
6. Be able to discuss the causes and consequences of compositional variation in common silicates.
7. Be able to discuss the thermodynamic consequences of mineral stability.
8. Be able to discuss to energetic consequences of solid solution, exsolution and phase diagrams.
9. Be familiar with kinetic processes in mineralogy.
10. Be familiar with the causes and consequences of transformation processes in mineralogy.

**Methods for assessing expected learning outcomes:**

1. Student/professor interactions during lecture and office hours.
2. Completion of practical projects.
3. Preparation and presentation of results from an independent study project.
4. Maintenance of a reading list.
5. Preparation and presentation of literature during class hours.
6. Preparation and presentation of literature review papers.

**Prerequisites:** Instructor permission.

**Syllabus:**

Recommended texts – Introduction to Mineral Sciences, Andrew Putnis, Cambridge Press

**Grading**

To complete and pass the course each component must be completed. The components are:

- Satisfactory lecture attendance (0%)
- Participation in lecture discussions (0%)
- Completion of practical assignments and problem sets (40%)
- Completion of personal projects (40%)
- Presentation of bibliography (20%)
Failure to participate or complete any of the course components will endanger your successful completion of the course. "Make-up" procedures will be at the discretion of the teaching team and may be written, practical or viva.

Grades (A through C) will be awarded based on the following scale.
A = 70-100%; B = 60-69%; C = 50-59%.

Academic Integrity Policy

Plagiarism and academic misconduct will not be tolerated. Examples of violations with regard to this course include copying and/or using another student's homework or extra credit material (from this or previous semesters), plagiarizing and/or failing to cite references for projects, and copying or using unauthorized materials during quizzes/exams. Ignorance of the academic integrity policy is not an acceptable excuse and will not exempt you from being subject to its ramifications. See Student Handbook, 2004-2005, Code of Student Conduct, Part IX, Section B item number 3 of the following website: http://www.depts.ttu.edu/studentsjudicialprograms/PDF-WordFiles/IntegrityMatters.pdf if you have further questions.

ADA Statement

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

Advanced Mineralogy and Crystal Chemistry
Spring 2012
Course Outline and Overview

The course will be broadly based on the textbook: Andrew Putnis (1992) Introduction to Mineral Sciences, Cambridge University Press. A copy of it is not required, but may prove valuable if you have an interest in pursuing mineralogically oriented research. A copy for the library has also been requested.

In addition to the text book students must be prepared to investigate other resources, including text books and journal publications.

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<thead>
<tr>
<th>Week of</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>January 17</td>
<td>Review of Minerals and Mineralogy</td>
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<tr>
<td>Practical Task</td>
<td>Radiation Safety Training</td>
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<tr>
<td>January 23</td>
<td>Crystallography, periodicity and symmetry</td>
<td>Ch.1</td>
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<td>Practical Tasks</td>
<td>Intro to XRD instrument and protocol write up.</td>
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<td>Space groups and stereographic projections</td>
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<td>January 30</td>
<td>Anisotropy and physical properties of minerals</td>
<td>Ch.2</td>
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<tr>
<td>Practical Tasks</td>
<td>2-page review on impact of anisotropy to Geophysics</td>
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<tr>
<td>February 6</td>
<td>X-ray Diffraction</td>
<td>Ch. 3</td>
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<tr>
<td>Practical Tasks</td>
<td>Phase identification in a mixed powder</td>
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<tr>
<td>February 13</td>
<td>XRD continued</td>
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Practical Tasks  Data collection and interpretation of research relevant sample

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<tr>
<th>Date</th>
<th>Task Description</th>
<th>Chapter(s)</th>
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<tbody>
<tr>
<td>February 20</td>
<td>Transmission Electron Microscopy</td>
<td>Ch. 3</td>
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<td>Image collection and interpretation of clay or nano-particles</td>
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<td>February 27</td>
<td>Spectroscopic methods in mineralogy</td>
<td>Ch. 4</td>
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<td>Pattern interpretation and explanation</td>
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<td>March 5</td>
<td>No lectures – personal study and research paper</td>
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<td>March 12</td>
<td>No lectures – Spring Break.</td>
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<td>March 19</td>
<td>Structure of non-silicates and packing</td>
<td>Ch. 5</td>
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<td>Develop personal study proposal</td>
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<td>March 26</td>
<td>Structure of silicate minerals</td>
<td>Ch. 6</td>
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<td>Prepare literature review for personal study project</td>
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<tr>
<td>April 2</td>
<td>Crystal chemistry and phase diagrams</td>
<td>Ch. 6, 8 &amp; 9</td>
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<td>Phase diagram interpretation</td>
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<td>April 9</td>
<td>Application of solid-solutions</td>
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<td>Paper review on an application of solid-solution to research</td>
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<tr>
<td>April 16</td>
<td>Energetics &amp; Kinetics – Ordering</td>
<td>Ch. 9</td>
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<td>Review a mineralogical system with ordering</td>
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<td>April 23</td>
<td>Energetics &amp; Kinetics – Exsolution</td>
<td>Ch. 11</td>
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<td>Petrologic examples of exsolution</td>
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<td>April 30</td>
<td>Energetics &amp; Kinetics – Transformations</td>
<td>Ch. 12</td>
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<td>Induced versus spontaneous transformations</td>
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<td>May 7</td>
<td>Personal presentations of individual study projects</td>
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Requirements for successful completion of the course include

1. Class attendance and participation
2. Weekly assignments
3. Research proposal
4. Literature review related to proposal
5. Personal project write-up
6. Presentation of project
7. Maintenance of bibliography
Syllabus 4323 and 5323; Non-seismic methods in geophysics; MW 10:00-10:50;
Lab: F10:00AM every week! Lab instruction will be given at 10:00 AM every Friday.
   Weeks where we do in class or computer labs we will stay from 10:00 to 12:50.
   We will meet in the graduate students lead work groups for those labs that require equipment.
   Graduate students will stay every Friday to receive instruction on how to run their labs.
   We ay also have a weekend day trips for a few labs.
Prof: Gurrola; Office: 311, phone: 742-3299; Cell: 577-6848; email: harold.gurrola@ttu.edu
hours: by arrangement, my hours never match yours so email me or call for an appointment.
Prerequisite: GEOL2303 and MATH1351
Objective:
The objective of this course is to gain an understanding of the basic physical principles behind the
potential field and electromagnetic methods in geophysical exploration and the application of these
tools to geological problems. For the graduate students there is the larger objective to be able to
derive many of the equations used on the class and labs.
Subjects will include:
   Physical properties of Earth Materials (density, conductivity etc...)
   Gravity data collection, processing and interpretation
   Magnetic data collection and interpretation
   2-D analysis of spatial data and 2-D filtering
   D.C. resistivity data acquisition, modeling and processing
   I.P and S.P. methods
   Electromagnetic tools of exploration.
Grading:
Homework and Lab assignments (p/f undergraduates): Most of the homework will come from lab
projects. All students will collect, process and model an data collected. Graduate students will assemble
the results from their crew into reports. You homework/labs will be graded as pass (p) or fail (f). If you
receive an "f" you can redo it. You must have a "p" on every lab and homework to pass the class. All
labs will be due the second Monday after they are assigned (10 days after assigned); homework will
be due the first Monday after the assignment.
Quizzes (you must have over a 50% to pass the class and over a 70% to get an A or B in the class):
   These will be closely related to the material covered in the homework and lab assignments. These
quizzes will be given the Monday that the homework/lab assignments are due. These will be in the style
of the final exam questions and cumulatively serve in place of a midterm exam. You will have the
option to complete these quizzes in class for full credit or at home for half credit.
Final Exam (A, B, C, D, F): The final exam will have two sections.
   Section one will cover the practical aspects of the class. That is the vocabulary of the geophysical
methods, a working knowledge of field procedures, data processing and modeling. You must
demonstrate a competency (get a 70% or higher) in your answers to these questions to receive a C or
higher in this class.
   Section two will test will test your deeper understating of the methods discussed in the class. You will
have to demonstrate an understanding of the theoretical basis for the tools discussed in the class. This
section will be used to separate the As from the Bs. To receive a B you must demonstrate the ability to
design a geophysical investigation to resolve different geological problems. To receive an A you will be
able to demonstrate a understanding of the geophysical theory behind the methods discussed in the
class. A 85% or higher on this section will be required to receive an "A" in the class. A 70% or higher
will earn a "B". Graduate students will have a few questions with regard to the theory behind these tools
that are not required for the undergraduates.
Expected Learning Outcome
1) The student will develop an understanding of what properties of the material each geophysical tool is sensitive to.

2) They will have a basic understanding of the physical laws that each method is based on.

3) The students should develop a knowledge of geophysical data acquisition and should be able to work independently on data acquisition.

4) The student will develop an understanding the processing techniques for each of these tools and how to interpret these data.

Additional learning outcomes for graduate students

5) To be able to derive from first principles equations used to model gravity, electrical and electromagnetic data.

Assessment

1) A test will be given on the first day of class. This test will be repeated at the end of the semester to determine if the students accomplished the goals of the class. The questions will be broken up by subject matter to determine what material was adequately covered and what needs further development.

2) Regular homework and lab assignments will be given that are designed to expand the student’s knowledge of each geophysical method. I will identify problems in the understanding of the material when grading the homework and use class discussion to correct short comings or misunderstanding.

3) Pop quizzes will be given on the day certain homework lab assignments are turned in. The quizzes will give the instructor the opportunity to determine how well the students retain the information from homework. The material from the quizzes will be summarized by the instructor after the quiz and will be the subject of class discussion.

4) I will meet separately with the graduate students toward the end of the semester and review their additional homework assignments to evaluate their overall understanding of the theory behind the methods used in the class.

Absences:
While role is not taken absences on days with a quiz or test will not be excused except due to illness (with doctor note), official approved trips and religious observances. In accordance with Texas Tech Catalogue prior notification of such absences will be required.

Student Absence for Observance of Religious Holy Day (OP 34.19)
1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)
Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as possible to make necessary arrangements. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been
provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

Faculty members are required to announce the following within the first two class periods: "I would appreciate hearing from anyone who has a disability that may require special accommodation. I am sure we can work out whatever arrangements are necessary. Please make an appointment with me during my office hours."

**Academic Honesty & Integrity (OP 34.12)**

From OP 34.12: "It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. "Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act."
Course Objective: Modern field mapping technology uses the Global Positioning System (GPS) to capture the location of point, line and area features - and collect the attributes associated with those features. In this course you will learn how GPS works, how to use mapping-grade GPS receivers, how to use mobile mapping software, how to apply differential corrections to your field data, and how to plan and manage a field mapping project. In addition this course will also cover basic crowd sourcing technologies and how to develop GPS applications.

Prerequisites: Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GIST 3300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:

1) Understand the principles of global satellite navigation systems (GNSS)
2) Demonstrate a clear understanding of the GPS signal and issues with satellite positioning
3) Demonstrate basic proficiency to collect, record and process spatial data
4) Post-process GPS field data and perform differential corrections
5) Plan, manage and carry out a successful field mapping project - and document the process.

Assessment: There are two exams in this course (a midterm and a final), a series of field and lab assignments, and a final project that includes a written report. The exams will be used to assess learning outcomes 1 and 2. You are required to complete each of the field and lab assignments, but they will not be graded. Your ability to work through these assignments will be used to assess your field mapping and computer skills. The field assignments are designed to assess learning outcome 3 and the lab assignments are designed to assess learning outcome 4. The successful development of a final field mapping project and class presentation will be used to assess learning outcome 5.

Grading: The midterm and final exams are each worth 100 points and the final project is worth 100 points. Your final grade is therefore based on a possible total of 300 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab: You are required to enroll in the lab for GIST 4310. Attendance in Lab is mandatory.

Required USB Flash Drive: To save your field and lab assignments and your final project, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 4 GB flash drive is recommended.

Field and Lab Assignments: You are expected to complete each of the lab assignments during the scheduled lab class time. Ten points will be deducted for each missed field or lab assignment.

Exam Format: The midterm and final exams will consist of two parts. First, a combination of multiple choice, short answer and short essay questions. And the second part will be a lab exam. The exams will be based upon the material covered in lecture, lab and reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013.
# FALL 2013

## CLASS SCHEDULE

**GIST 4310: MOBILE FIELD MAPPING AND DATA ACQUISITION**

<table>
<thead>
<tr>
<th>LECTURE</th>
<th>LAB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUG</strong> 26</td>
<td>Introduction (course topics and logistics)</td>
</tr>
<tr>
<td>28</td>
<td>Reference Systems</td>
</tr>
<tr>
<td><strong>SEP</strong> 2</td>
<td>Holiday – no class</td>
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<tr>
<td>4</td>
<td>Principles of GPS (Trilateration)</td>
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<td>9</td>
<td>Principles of GPS Operation (PDOP, GDOP etc...)</td>
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<td>11</td>
<td>GPS Error Correction and Accuracy Issues</td>
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<tr>
<td>16</td>
<td>Differential Correction and Introduction to ArcPad</td>
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<td>18</td>
<td>Principles of ArcPad I</td>
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<td>23</td>
<td>Principles of ArcPad II</td>
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<tr>
<td>25</td>
<td>ArcGIS and GPS</td>
</tr>
<tr>
<td>30</td>
<td>Importing and Exporting Data to and from ArcGIS</td>
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<tr>
<td><strong>OCT</strong> 02</td>
<td>ArcPad Extension for ArcGIS</td>
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<td>07</td>
<td>GPS Post Processing</td>
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<td>09</td>
<td>GPS and Maps</td>
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<td>14</td>
<td><strong>EXAM 1</strong></td>
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<tr>
<td>16</td>
<td>Planning Data Collection</td>
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<td>Data Collection on a Laptop or Tablet Computer</td>
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<td><strong>No Class</strong></td>
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<tr>
<td>28</td>
<td>GPS and Mobile Applications</td>
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<td>30</td>
<td>GPS Correct</td>
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<td><strong>NOV</strong> 04</td>
<td>Introduction to ArcSDE</td>
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<td>06</td>
<td>ArcSDE Implementation</td>
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<td>ArcSDE and Final Project</td>
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<td>ArcSDE and Final Project Contd.</td>
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<td>20</td>
<td>Crowdsourcing</td>
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<td>25</td>
<td>Creating Open Source Crowd Mapping Applications</td>
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<td>27</td>
<td>Holiday – no class</td>
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<tr>
<td><strong>DEC</strong> 02</td>
<td>Final Project Presentations</td>
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<td>04</td>
<td>Final Review</td>
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<tr>
<td>05</td>
<td><strong>Individual Study Day – no class</strong></td>
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<tr>
<td>06</td>
<td><strong>EXAM 2</strong> - Friday, December 6th at 1:30 p.m.</td>
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</tbody>
</table>

**LAB**

- Lab Setup
- Topographic Map Exercise
- **No lab**
- Map Navigation Exercise
- Map and Basic GPS Navigation
- GPS Operations
- ArcPad Operations I
- ArcPad Operations II
- ArcPad Field Exercise I
- ArcPad Field Exercise II
- Import and Export to ArcGIS
- ArcPad Extension Exercise
- Tracks and Areas
- Measuring Areas and Cartographic Display
- **LAB EXAM 1**
- Working with Almanacs and Planning Tools
- Geocaching
- No Lab
- GPS on Phones and other Devices
- Field Data Collection Demonstration
- ArcSDE Exercise
- Export GPS Data to Google Earth
- Final Project
- Final Project
- Final Project
- Crowd Sourcing Application
- Finalize Crowdsourcing Application
- Final Project Presentations
- Final Review
Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)

Any student who, because of a disability, might require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements either at the beginning of the semester or upon diagnosis of disability. Students must present appropriate verification from Student Disability Services during the instructor’s office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

Student Absence for Observance of Religious Holy Day (OP 34.19)

1. “Religious holy day” means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Academic Honesty & Integrity (OP 34.12)

From OP 34.12: “It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

“Scholastic dishonesty” includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.”
SPRING 2013
GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY
GIST 3300: GEOGRAPHIC INFORMATION SYSTEMS

Dr. Kevin R. Mulligan                  Lecture: MW 12:00 - 12:50 p.m.
Office: 208 Holden Hall                Phone: 742-2466 ext 243
Office Hours: MW 1:00 - 2:00 p.m. or by appointment.      Email: kevin.mulligan@ttu.edu
Lab Instructors: Sammy Tabrizi, Lionel Plummer, Chris Van Nice

Course web site:  http://gis.ttu.edu/gist3300

Course Objective: Geographic information systems are computer systems designed to manage and analyze spatial data, where spatial data can be any data that are tied to places or geographic coordinates. In this course we will develop a basic understanding of geographic information systems using ArcGIS, a very powerful and widely-used desktop GIS.

Prerequisites: Working knowledge of the Microsoft Windows environment

Learning Outcomes: After completing this course, students will be able to:

1) explain what a GIS is, how it works, and what it can do,
2) understand the basic principles of georeferencing (datums and coordinate systems),
3) manage spatial data as shapefiles, personal geodatabases and file geodatabases
4) to query and analyze spatial data - and create publication quality maps,
5) apply basic cartographic principles in the creation of publication quality maps
6) develop a spatial model as a decision support tool and document the analysis.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, homework assignments, a county basemap project, and a final project that includes a written term paper. The exam questions will be drawn from the material covered in lecture and used to assess your understanding of the basic concepts introduced in the course, learning outcomes 1 and 2. You are required to complete each of the lab assignments, but they will not be graded. Your ability to successfully work through these assignments will be used to assess your GIS computer software skills, learning outcomes 2-5. The county basemap project is designed to develop and assess your cartographic skills, learning outcome 5. The successful development of a final project will be used to assess learning outcome 6.

Required Lab: You are required to enroll in one of the lab sections for GIST 3300.


Required USB Flash Drive: To save your lab and homework, you need to purchase a USB flash drive early in the semester. Since GIS data can take up a lot of space, a minimum 2 GB flash drive is required.

Assessment and Grading: There are two exams in this course (a midterm and a final), one county basemap project and one final project. Each lecture exam is worth 100 points. The county basemap project is worth 50 points and the final project is worth 100 points. Your final course grade is therefore based upon a possible total of 350 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Map Assignments and Homework: You are expected to complete the scheduled map assignments during the lab class time. Ten points will be deducted for each missed map assignment. The assigned homework will not be graded.

Exams: The lecture exams will consist of a combination of true/false, multiple choice, matching and short answer questions. The exams will be based upon the lectures and reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made only in the case of a university approved excused absence.

Class and Lab Attendance: Attendance in lecture and lab is required. If you have any problems during the semester, please let us know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Wednesday, March 27, 2013.

Disability Statement: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact me as soon as possible to make any necessary arrangements.
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<td>Basemap Data - DEMs, DRGs, NAIP imagery</td>
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<td>MAY</td>
<td>01</td>
<td>25 Enterprise Applications of GIS (asset management)</td>
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<td>Sharing data and maps (GeoPDFs, virtual globes)</td>
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<td><strong>EXAM 2 - Tuesday, May 14, 7:30 - 10:00 a.m.</strong></td>
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<td><strong>FINAL PROJECT DUE</strong></td>
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**LAB TOPIC**

1. Map Assignment 1
2. Map Assignment 2
3. Map Assignment 3
4. Map Assignment 4, Lat-Long Exercise
5. Map Assignment 5, UTM Exercise
6. Map Assignment 6, SPCS Exercise
7. Map Assignment 7, PLSS Exercise
8. County Basemap Project
9. County Basemap Project
10. County Basemap Project
11. Final Project
12. Final Project
13. Final Project
14. Final Project

**Homework**

Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7
Chapter 8
Chapter 9
Chapter 10
Chapter 11
SPRING 2013
GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY
GIST 5300: GEOGRAPHIC INFORMATION SYSTEMS

Dr. Kevin R. Mulligan
Office: 208 Holden Hall
Office Hours: MW 1:00 - 2:00 p.m. or by appointment.
Lab Instructors: Sammy Tabrizi, Lionel Plummer, Chris Van Nice

Course web site: http://gis.ttu.edu/gist3300

Course Objective: Geographic information systems are computer systems designed to manage and analyze spatial data, where spatial data can be any data that are tied to places or geographic coordinates. In this course we will develop a basic understanding of geographic information systems using ArcGIS, a very powerful and widely-used desktop GIS.

Prerequisites: Working knowledge of the Microsoft Windows environment

Learning Outcomes: After completing this course, students will be able to:

1) explain what a GIS is, how it works, and what it can do,
2) understand the basic principles of georeferencing (datums and coordinate systems),
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4) to query and analyze spatial data - and create publication quality maps,
5) apply basic cartographic principles in the creation of publication quality maps
6) develop a spatial model as a decision support tool and document the analysis.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, homework assignments, a county basemap project, and a final project that includes a written term paper. The exam questions will be drawn from the material covered in lecture and used to assess your understanding of the basic concepts introduced in the course, learning outcomes 1 and 2. You are required to complete each of the lab assignments, but they will not be graded. Your ability to successfully work through these assignments will be used to assess your GIS computer software skills, learning outcomes 2-5. The county basemap project is designed to develop and assess your cartographic skills, learning outcome 5. The successful development of a final project will be used to assess learning outcome 6.

Required Lab: You are required to enroll in one of the lab sections for GIST 5300.


Required USB Flash Drive: To save your lab and homework, you need to purchase a USB flash drive early in the semester. Since GIS data can take up a lot of space, a minimum 2 GB flash drive is required.

Assessment and Grading: There are two exams in this course (a midterm and a final), one county basemap project and one final project. Each lecture exam is worth 100 points. The county basemap project is worth 50 points and the final project is worth 100 points. Your final course grade is therefore based upon a possible total of 350 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

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<td>County Basemap Project</td>
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<td>17</td>
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<td>09</td>
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<tr>
<td>14</td>
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<td>County Basemap Project</td>
</tr>
</tbody>
</table>

FINAL PROJECT DUE
GIST 4302/5302: Spatial Analysis and Modeling

FALL 2013

Lectures: Tuesdays & Thursdays 2:00pm-2:50pm, Science 234
Lab sessions: Tuesdays or Thursdays 3:00pm-4:30pm, Holden 204

Instructor: Guofeng Cao  
Office: Holden Hall 211  
Office Hours: T, Th 1pm-2pm  
Email: guofeng.ca@ttu.edu

Teaching Assistant: Samaneh ‘Sammy’ Tabrizi  
Office: Holden Hall 209  
Office Hours: M 5pm-6pm, T 11am-12am  
Email: samaneh.tabrizi@ttu.edu

This syllabus is tentative and subject to change

1 Course description

With the continuing advances of technological development, spatial data have been easily and increasingly available in the past decades and becoming important information sources in daily decision makings. This class is intended for students (undergraduate and graduate students) from relevant disciplines (e.g., geography, geology, environmental science and social sciences) who are interested in analysis of spatial data. Students will be encouraged to engage this course with their thesis/dissertation topics and research interests.

This course will introduce fundamental concepts and commonly used methods in quantitative analysis of spatial data. Specifically, this course includes:

- Representation of spatial data (fundamentals in spatial databases)
- Concepts in spatial analysis and spatial statistics
- Spatial analysis methods for various types of spatial data (spatial points, networks, and areal/lattice data), including overlay/suitability analysis, spatial statistical methods such as exploratory spatial data analysis (e.g., Moran’s I), spatial interpolation (e.g. kriging) and spatial regression.

A lab/discussion session (approximately 2 hours) follows the lecture for students to gain hands-on experiences on real-world datasets by using multiple software tools. The software packages utilized in lab sessions include ArcGIS, Open GeoDa, CrimeStat, R or Matlab. Students with expertise or interest in the statistical package R or Matlab are encouraged to use them but it is not required.
2 Prerequisites

Prerequisites of this course includes an understanding of basic algebra, statistics and matrix manipulations, and working knowledge of at least one GIS software packages, e.g. ArcGIS, which could be fulfilled with GIST 3300/5300. However, students from different disciplines are welcome, please contact the instructor should there any question about the prerequisites.

3 Learning outcomes

After completing this course, the students are expected to learn how to:

- formulate real-world problems in the context of geographic information systems and spatial analysis
- apply appropriate spatial analytical methods to solve the problems
- utilize mainstream software tools (commercial or open-source) to solve spatial problems
- evaluate and assess the results of alternative methods
- communicate results of spatial analysis in the forms of writing and presentation

4 Readings

The main course text is:


The following books will be helpful for some topics of this class, and additional readings will be suggested as the class progresses.


For the lab assignments, you might find the following book helpful if using ArcGIS:


if using R:


if using Matlab:


5 Assessment

There are two written exams in this course (a midterm and a final), lab exercises, and a final project that includes a project proposal and final report. The exams are used to assess your understanding of the basic concepts discussed in the lecture, and the format of the exams will consist of a combination of multiple choice, short answer and short essay questions.

The purpose of the final project is to provide experiences for students to apply the methods and tools learned from this class to real-world spatial problems. Topics of the final project could be related to the spatial aspect of a thesis or another course work. The proposal associated with the final project should include a clear description of the proposed problems with appropriate background literatures justifying the motivation, description of the collected data sources, and methodology adopted to address the problem. When the project proposal is due (Nov. 5th), students are expected to have collected the necessary data at hand. The final project will require a presentation of about 6-10 mins (*PechaKucha style: http://en.wikipedia.org/wiki/Pecha_Kucha*), and a final project report. Students are encouraged to start thinking of project ideas early in the semester, and communicate them with the instructor and the TA for feedbacks and comments.

6 Grading

Each exam, lab exercise and final project is worth 100 points, and the final points will be a combination of these three elements according to the following weights:
• two written exams: 30% (each 15%)

• eight lab exercises: 40% (each 5%)

• final project proposal (5%), presentation (10%) and paper (15%) : 30%

To ensure a specific grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

7 University policy

• Academic honesty (OP 34.12): http://www.depts.ttu.edu/opmanual/OP34.12.pdf

• Students with disabilities (OP 34.22): http://www.depts.ttu.edu/opmanual/OP34.22.pdf

• Students absence for observance of a religious holy day (OP 34.19): http://www.depts.ttu.edu/opmanual/OP34.19.pdf
# Course Outline

<table>
<thead>
<tr>
<th>Week #</th>
<th>Lecture Dates</th>
<th>Lecture Topics</th>
<th>Readings</th>
<th>Lab/Discussion Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug. 27th</td>
<td>Overview of the course</td>
<td>O'S&amp;U ch.1</td>
<td>Review of map projections and ArcMap</td>
</tr>
<tr>
<td>1</td>
<td>Aug. 28th</td>
<td>Introduction to spatial data analysis</td>
<td>O'S&amp;U ch.1, 10</td>
<td>Spatial query: Finding what's inside</td>
</tr>
<tr>
<td>2</td>
<td>Sept. 3rd &amp; 5th</td>
<td>Spatial data representation and spatial operations</td>
<td>O'S&amp;U appendix A-B</td>
<td>Spatial query: Finding what's nearby</td>
</tr>
<tr>
<td>3</td>
<td>Sept. 10th</td>
<td>Probability and statistics review</td>
<td>O'S&amp;U ch.4-5</td>
<td>Point pattern analysis</td>
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<tr>
<td>3</td>
<td>Sept. 12th</td>
<td>Pitfalls and potentials of spatial data</td>
<td>O'S&amp;U ch.7</td>
<td>Descriptive spatial statistics using GeoDa</td>
</tr>
<tr>
<td>4</td>
<td>Sept. 17th &amp; 19th</td>
<td>Spatial point pattern analysis</td>
<td>O'S&amp;U ch.8-9</td>
<td>Model builder and map algebra in ArcGIS</td>
</tr>
<tr>
<td>5</td>
<td>Sept. 24th &amp; 26th</td>
<td>Spatial statistics of area objects, exploratory spatial analysis</td>
<td>O'S&amp;U (1st Edition) ch. 11</td>
<td>Proposal due (data should be ready) &amp; Student project</td>
</tr>
<tr>
<td>6</td>
<td>Oct. 1st &amp; 3rd</td>
<td>Describing and analyzing continuous phenomena</td>
<td>F&amp;B&amp;C ch.1</td>
<td>Spatial regression using GeoDa</td>
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<tr>
<td>7</td>
<td>Oct. 8th</td>
<td>Review and student project discussion</td>
<td>F&amp;B&amp;C ch.3, 5</td>
<td>Geographically weighted regression using GeoDa</td>
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<tr>
<td>7</td>
<td>Oct. 10th</td>
<td>Exam 1</td>
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<td>8</td>
<td>Oct. 15th &amp; 17th</td>
<td>Introduction to geostatistics (kriging)</td>
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<td>9</td>
<td>Oct. 22nd &amp; 24th</td>
<td>Simple linear regression and spatial regression</td>
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<td>10</td>
<td>Oct. 29th &amp; 31th</td>
<td>More regressions (e.g., geographically weighted regression)</td>
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<tr>
<td>11</td>
<td>Nov. 5th &amp; 7th</td>
<td>Analysis of multivariate spatial data</td>
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<td>12</td>
<td>Nov. 12th</td>
<td>Spatial classification and clustering</td>
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<td>13</td>
<td>Nov. 19th &amp; 21th</td>
<td>Spatial uncertainty &amp; frontiers of spatial analysis</td>
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<td>14</td>
<td>Nov. 26th</td>
<td>Project presentation</td>
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<tr>
<td>14</td>
<td>Nov. 28th</td>
<td>Thanksgiving holidays</td>
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<tr>
<td>15</td>
<td>Dec. 3rd</td>
<td>Review</td>
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<td>15</td>
<td>Dec. 5th</td>
<td>Individual study day</td>
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<td>16</td>
<td>Dec. 6th</td>
<td>Exam 11</td>
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<tr>
<td>16</td>
<td>Dec. 8th</td>
<td>Student project report due</td>
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</tbody>
</table>
Course Objective: In a professional GIS environment spatial data are stored in a geodatabase, the native format for ArcGIS. In this course we will learn about the structure and functionality of the geodatabase and how the geodatabase is used to create, edit and manage spatial data. Specific topics will focus on how to design and create a geodatabase, with domains and subtypes, efficiently load vector and raster data in a geodatabase, create and edit features, work with tables, manage labels and annotation, and georeference data. More advanced topics will introduce you to the geodatabase topology and geoprocessing with Model Builder.

Prerequisite: Prior or concurrent enrollment in GIST 5300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:
1) explain what a geodatabase is, how it works, and what it can do,
2) apply geodatabase behaviors to model real-world features,
3) efficiently input vector and raster data in a geodatabase,
4) manage labels annotation and map text,
5) georeference vector and raster data,
6) understand how to build, use and edit data in a topology,
7) use Model Builder to construct a simple analytical geoprocessing model - and document the procedures.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, homework assignments and assigned readings and final project with written report. The exams will be drawn from the material covered in both lecture and lab and will be used to assess your understanding of the concepts introduced in the course, learning outcomes 1 through 6. You are required to complete each of the lab assignments. The lab assignments are designed to develop your geoprocessing skills and your ability to work through these assignments will also be used to assess learning outcomes 1 through 6. Lastly, your ability to successfully develop a simple geoprocessing model will be used to assess learning outcome 7.

Grading: The midterm and final exams are each worth 100 points. The geoprocessing final model project with written report is worth 100 points. Each lab/homework assignment is worth 10 points. There will be approximately 20 lab/homework assignments for a total of 200 points. Your final grade is therefore based on a possible total of 500 points. To ensure a grade in this course you must meet these minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab Section: You are required to enroll in one of the lab sections for GIST 5304.


Required USB Flash Drive: To save your homework, lab assignments and final project, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 2 GB flash drive is recommended.

Lab Assignments and Homework: You are responsible for the material assigned in the lab workbook. If you do not complete the lab assignment during the scheduled lab class time, they will be turned in as homework one week after it has been assigned. Ten points are deducted for each assignment that is not turned in or not completed on time.

Exam Format: The exams will be based upon the material covered in lecture, lab and assigned readings. The exams will consist of a combination of multiple choice, short answer covering the lecture and lab material and a short essay question based on the reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made only in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please contact me.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013 (counts against drop limit).
GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY

GIST 5304: ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

Lucia Barbato   - 118 Experimental Sciences Bldg
Lecture: TTh 9:30 - 10:20 a.m.
Lab:   TTh 10:30 - 11:20 a.m.
Tel: 742-3722 ext 242
E-mail: lucia.barbato@ttu.edu
Office Hrs: TTh 1:00 - 2:00 or by apt

Course Objective: In a professional GIS environment spatial data are stored in a geodatabase, the native format for ArcGIS. In this course we will learn about the structure and functionality of the geodatabase and how the geodatabase is used to create, edit and manage spatial data. Specific topics will focus on how to design and create a geodatabase, with domains and subtypes, efficiently load vector and raster data in a geodatabase, create and edit features, work with tables, manage labels and annotation, and georeference data. More advanced topics will introduce you to the geodatabase topology and geoprocessing with Model Builder.

Prerequisite: Prior or concurrent enrollment in GIST 5300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:
1) explain what a geodatabase is, how it works, and what it can do,
2) apply geodatabase behaviors to model real-world features,
3) efficiently input vector and raster data in a geodatabase,
4) manage labels annotation and map text,
5) georeference vector and raster data,
6) understand how to build, use and edit data in a topology,
7) use Model Builder to construct a compound analytical geoprocessing model - and document the procedures.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, homework assignments, assigned readings and final project with written report. The exam questions will be drawn from the material covered in both lecture and lab and will be used to assess your understanding of the concepts introduced in the course, learning outcomes 1-6. For graduate students, these exams will also include a short essay question based on the assigned reading. You are required to complete each of the lab and homework assignments. Your ability to work through these assignments will be used to assess your geoprocessing skills, learning outcomes 2-6. Lastly, your ability to apply critical thinking to successfully develop a compound analytical geoprocessing model will be used to assess learning outcome 7.

Grading: The midterm and final exams are each worth 100 points. The geoprocessing final model project with written report is worth 100 points. Each lab/homework assignment is worth 10 points. There will be approximately 20 lab/homework assignments for a total of 200 points. Your final grade is therefore based on a possible total of 500 points. To ensure a grade in this course you must meet these minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab Section: You are required to enroll in one of the lab sections for GIST 5304.


Required USB Flash Drive: To save your homework, lab assignments and final project, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 2 GB flash drive is recommended.

Lab Assignments and Homework: You are responsible for the material assigned in the lab workbook. If you do not complete the lab assignment during the scheduled lab class time, they will be turned in as homework one week after it has been assigned. Ten points are deducted for each assignment that is not turned in or not completed on time.

Exam Format: The exams will be based upon the material covered in lecture, lab and assigned readings. The exams will consist of a combination of multiple choice, short answer covering the lecture and lab material and a short essay question based on the reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made only in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please contact me.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013 (counts against drop limit).
Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)

Any student who, because of a disability, might require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements either at the beginning of the semester or upon diagnosis of disability. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

Student Absence for Observance of Religious Holy Day (OP 34.19)

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Academic Honesty & Integrity (OP 34.12)

From OP 34.12: “It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

“Scholastic dishonesty” includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.”

Safety Procedures

In the event of a fire alarm or building alarm that is not for a tornado students should follow the instructor to the exit that has been established in the building safety document. To exit students should proceed to the right of the room, down the hall to the exit doors facing east. Students should proceed to the south east and wait by the fire stairs outside the xx building until the all clear has been sounded.

In the event of a tornado students should follow the instructor along the hall that runs north of the class room, then to the nearest stairway that leads to the basement.
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Lab Topic</th>
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<tbody>
<tr>
<td>AUG 27</td>
<td>1 Introduction (course topics and logistics)</td>
<td>Lab 1 – Connect to Server / Review lab</td>
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<td>2 Geodatabase Design</td>
<td>Lab 2 – Tutorial 1-1 Exercise 1-1</td>
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<td>SEP 3</td>
<td>3 Physical DBD &amp; Data types</td>
<td>Lab 3 – Tutorial 1-2 Exercise 1-2</td>
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<td>5 ArcGIS Overview, Domains, Subtypes</td>
<td>Lab 4 – Tutorial 2-1 Exercise 2-1</td>
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<td>10 5 Geodatabase formats</td>
<td>Lab 5 – Tutorial 2-2 Exercise 2-2</td>
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<td></td>
<td>12 6 Projections and Datums (shapefile review)</td>
<td>Lab 6 – Map Projections</td>
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<td></td>
<td>17 7 Spatial &amp; Tabular formats / Loading Data</td>
<td>Lab 7 – Tutorial 3-1 Exercise 3-1</td>
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<tr>
<td></td>
<td>19 8 Labels, Annotation Features and Map Text</td>
<td>Lab 8 – Labels and Anno &amp; Tut 8-1 &amp; Tut 8-2</td>
</tr>
<tr>
<td></td>
<td>24 9 Create New Simple Feature Classes</td>
<td>Lab 9 – Tut 4-1 Ex 4-1 &amp; Build File GDB</td>
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<tr>
<td></td>
<td>26 10 Assigning Behavior to Features (domains &amp; subtypes)</td>
<td>Lab 10 – Creating and Applying Domains</td>
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<td>OCT 1</td>
<td>09 Editing Spatial Data</td>
<td>Lab 11 – Editing spatial data / Tut 4-2</td>
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<tr>
<td></td>
<td>3 10 Editing Tabular Data</td>
<td>Lab 12 – Editing tabular data / Ex 4-2</td>
</tr>
<tr>
<td></td>
<td>8 11 Work with Tables (joins, relates, relationship classes)</td>
<td>Lab 13 – Tabular Data Management</td>
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<td></td>
<td>10 12 Review for Exam</td>
<td>All Assignments Due</td>
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<td>15</td>
<td>EXAM 1</td>
<td>Lab 14 – Symbolization &amp; Classification Review</td>
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<td>17</td>
<td>13 Exam Review / Final Project Requirements</td>
<td>Work on Final Project Proposal</td>
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<td>22</td>
<td>No Lecture</td>
<td>Lab 15 – Georeferencing Tut 4-5 Ex 4-5</td>
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<tr>
<td>24</td>
<td>14 Georeferencing, Spatial Adjustment</td>
<td>Draft Project Proposal Due</td>
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<tr>
<td>29</td>
<td>15 Map Layouts</td>
<td>Lab 16 – Map Layouts</td>
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<tr>
<td>31</td>
<td>16 What is Topology?</td>
<td>Lab 17 – Tutorial 5-1, Ex 5-1</td>
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<td>31</td>
<td>17 Geodatabase Topology</td>
<td>Final Project Proposal Due</td>
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<td>18 Geoprocessing and Analysis</td>
<td>Lab 18 – Tutorial 5-3 Ex 5-3</td>
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<td>31</td>
<td>19 Sharing Data</td>
<td>Lab 19 – Geoprocessing &amp; Analysis</td>
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<td>14 20 Customizing the Interface</td>
<td>Lab 20 – Sharing Data</td>
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<td></td>
<td>19 21 Geoprocessing with Model Builder</td>
<td>Lab 21 – Customizing / Tut 6-1 / Ex 6-1</td>
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<td></td>
<td>21 22 Geoprocessing with Model Builder</td>
<td>Lab 22 – Final Projects</td>
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<tr>
<td>26</td>
<td>23 Multi-User Geodatabases (ArcGIS Server technology)</td>
<td>Lab 23 – Final Projects</td>
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<td>28</td>
<td>Thanksgiving Holiday</td>
<td>All Lab Assignments Due</td>
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<tr>
<td>DEC 3</td>
<td>24 Course Review</td>
<td>Lab 24 – Final Projects</td>
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<td>5</td>
<td>Individual Study Day - no class</td>
<td>Lab 25 – Final Projects</td>
</tr>
<tr>
<td>09</td>
<td>EXAM 2 7:30 – 10:00 am</td>
<td>FINAL PROJECT DUE</td>
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<td>Open Lab Dec 4 - 6</td>
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</table>
Course Objective: In a professional GIS environment, spatial data are stored in a geodatabase, the native format for ArcGIS. In this course, we will learn about the structure and functionality of the geodatabase and how the geodatabase is used to create, edit, and manage spatial data. Specific topics will focus on how to design and create a geodatabase with domains, understand map projections, efficiently load vector and raster data, create and edit features, fix topological errors, work with tables, manage annotation, and georeference data. More advanced topics will introduce you to the use of geodatabase topology and geoprocessing with Model Builder, which is widely used to support geoprocessing and analysis.

Prerequisite: Prior or concurrent enrollment in GIST 3300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:

1. explain what a geodatabase is, how it works, and what it can do,
2. understand geodatabase design and spatial data formats,
3. how to create a geodatabase and feature classes,
4. how to apply geodatabase behaviors to model real-world features,
5. understand map projections,
6. how to edit feature classes, how to build a topology, and edit data in a topology,
7. use geodatabase concepts to build a simple geodatabase with student data - and document the procedures.

Assessment: There are three exams in this course (two midterms and a final), lab assignments, homework assignments, and assigned readings, and final project with written report. The exams will be drawn from the material covered in both lecture and lab and will be used to assess your understanding of the basic concepts introduced in the course, learning outcomes 1 through 6. You are required to complete each of the lab assignments. The lab assignments are designed to develop your geoprocessing skills and your ability to work through these assignments will also be used to assess learning outcomes 1 through 6. Lastly, your ability to apply critical thinking to successfully develop a geodatabase and document it will be used to assess learning outcome 7.

Grading: The midterms and final exam are each worth 100 points. The final geodatabase project with written report is worth 100 points. Each lab/homework assignment is worth 10 points. There will be approximately 20 lab/homework assignments for a total of 200 points. Your final grade is therefore based on a possible total of 600 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab: You are required to enroll in one of the lab sections for GIST 4304.


Required USB Flash Drive: To save your homework, lab assignments, and final project, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 2 GB flash drive is recommended.

Lab Assignments and Homework: You are responsible for the material assigned in the lab workbook. You are not expected to complete the lab assignment during the scheduled lab class time, which will be turned in as homework one week after it has been assigned. Students will receive a zero for each lab/homework assignment that is not turned in, and 10 points will be deducted per day for lab/homework assignments not completed on time.

Exam Format: The exams will be based upon the material covered in lecture, lab, and assigned readings. The exams will consist of a combination of multiple choice, short answer and a short essay question.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made only in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please contact me.

Withdrawing: You are responsible for dropping the class. The last day to drop is Wednesday, March 26, 2014.
Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)
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Academic Honesty & Integrity (OP 34.12)
From OP 34.12: “It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

"Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act."

Safety Procedures
In the event of a fire alarm or building alarm that is not for a tornado students should follow the instructor to the exit that has been established in the building safety document. To exit students should proceed to the right of the room, down the hall to the exit doors facing east. Students should proceed to the south east and wait by the fire stairs outside the xx building until the all clear has been sounded.

In the event of a tornado students should follow the instructor along the hall that runs north of the class room, then to the nearest stairway that leads to the basement.
<table>
<thead>
<tr>
<th>LECTURE</th>
<th>Wk</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAN 16 Introduction (course topics and logistics) ArcGIS Overview</td>
<td>1</td>
<td>Connect to Server</td>
</tr>
<tr>
<td>21 02 History of GIS</td>
<td>2</td>
<td>ArcMap Review Symbolizing</td>
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<tr>
<td>23 03 Symbolizing Data</td>
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<tr>
<td>28 04 Classification</td>
<td>3</td>
<td>Classification Create GDB</td>
</tr>
<tr>
<td>30 05 Geodatabase formats</td>
<td></td>
<td></td>
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<tr>
<td>FEB 04 06 Create New Simple Feature Classes</td>
<td>4</td>
<td>Create FC Map Projections</td>
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<tr>
<td>06 07 Projections and Datums (shapefile review)</td>
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<tr>
<td>11 08 Spatial &amp; Tabular formats / Loading Data</td>
<td>5</td>
<td>Loading Data</td>
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<tr>
<td>13 09 MIDTERM</td>
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<tr>
<td>18 10 Editing Spatial Data</td>
<td>6</td>
<td>Editing Spatial Data</td>
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<tr>
<td>20 11 Editing Tabular Data</td>
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<td>Editing Tabular Data</td>
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<tr>
<td>25 12 Work with Tables (joins, relates, relationship classes)</td>
<td>7</td>
<td>Tabular Data Management Database Design</td>
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<tr>
<td>27 13 Geodatabase Design</td>
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<tr>
<td>MAR 04 14 Physical DBD &amp; Data types</td>
<td>8</td>
<td>Database Design Labels and Anno</td>
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<tr>
<td>06 15 Labels, Annotation Features and Map Text</td>
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<tr>
<td>11 16 Raster Data</td>
<td>9</td>
<td>Raster Data Georeferencing</td>
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<tr>
<td>13 17 Georeferencing, Spatial Adjustment</td>
<td></td>
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<tr>
<td>Week of March 17th Spring Break - no class</td>
<td>10</td>
<td>Map Layouts</td>
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<td>25 18 Map Layouts</td>
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<tr>
<td>27 19 MIDTERM</td>
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<tr>
<td>APR 01 20 Geodatabase Behavior &amp; Topology</td>
<td>11</td>
<td>GDB domains &amp; topology Validating/Editing topology</td>
</tr>
<tr>
<td>03 18 Validating/Editing Topology</td>
<td></td>
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<tr>
<td>08 19 Editing in a Topology</td>
<td>12</td>
<td>Editing in a topology Sharing Data</td>
</tr>
<tr>
<td>10 20 Sharing Data</td>
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<tr>
<td>15 21 Customizing the Interface</td>
<td>13</td>
<td>Customizing Geoprocessing</td>
</tr>
<tr>
<td>17 22 Geoprocessing</td>
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<tr>
<td>22 23 Geoprocessing</td>
<td>14</td>
<td>Final Project</td>
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<tr>
<td>24 24 Geoprocessing with Model Builder</td>
<td></td>
<td>Final Project</td>
</tr>
<tr>
<td>MAY 01 25 Final Projects</td>
<td>15</td>
<td>Final Project</td>
</tr>
<tr>
<td>06 Review for Exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07 Individual Study Day - no class</td>
<td>16</td>
<td>Open Lab Week of May 7 FINAL PROJECT DUE</td>
</tr>
<tr>
<td>09 FINAL EXAM Friday 7:30 – 10:00 am (verify)</td>
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</tr>
</tbody>
</table>
**SPRING 2014**

**GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY**

**GIST 4312/5312: INTERNET MAPPING**

Santosh Seshadri  
Office: 123 Experimental Sciences Building  
Office Hours: MW 2:00 - 3:00 p.m. or by appointment.  
Lecture: MW 3:00 - 3:50 p.m.  
Phone: 806-834-1146  
Email: santosh.seshadri@ttu.edu

**Course Objective:** Internet mapping is widely used to share and distribute geographic information over the Internet. In this course we will learn how to compose maps for the web environment, how to develop Internet mapping applications, and how to customize mapping interface and tools. While Internet mapping is widely used in government and private industry, in a university environment the technology is more often used to share data and maps that are tied to research. At the graduate level, this course will emphasize the development of research web-mapping applications. To develop these applications we will use ArcGIS server, and commonly used programming tools.

**Prerequisites:** Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GIST 3300/5300 or an equivalent course with department approval.

**Learning Outcomes:** After completing this course, students will be able to:

1. explain what Internet mapping is, how it works, and what it can do,
2. understand and apply the basic principles of web page development,
3. work with simple Google and Esri products to share spatial data and maps,
4. understand how to use and work with ArcGIS Server to create map services,
5. understand and explain the difference between JavaScript, HTML5 and Flex applications,
6. design, build and deploy a web-mapping application in your field of study - and document the process,
7. critically assess and critique web-mapping applications in their field of study.

**Assessment:** This course is offered as a piggybacked undergraduate and graduate course. Graduate students are expected to complete all of the undergraduate requirements – plus additional readings and graduate level requirements related to learning outcomes 6.

There are two exams in this course (a midterm and a final), lab assignments, and a final project (that includes a written report). The exams will be used to assess your understanding of the basic concepts introduced in the course, learning outcome 1. You are required to complete each of the lab assignments, but they will not be individually graded. Selected lab assignments will be integrated into a web portfolio that will be graded at the end of the semester. Your ability to work through these assignments and develop a web portfolio will be used to assess your application development skills, learning outcomes 2-5. The successful development of a final project and report will be used to assess learning outcomes 6 and 7.

**Grading:** The midterm and final exams are each worth 100 points. The web portfolio is worth 100 points, the final project is worth 100 points and the documentation is worth 50 points. Your final grade is therefore based on a possible total of 450 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

**Required Lab:** You are required to enroll in lab for GIST 4312/5312.


**Required USB Flash Drive:** To save your homework, lab assignments and projects, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 8 GB flash drive is recommended.

**Lab Assignments:** You are expected to complete each of the lab assignments during the scheduled lab class time. Certain labs will be combined to build your web portfolio.
Exam Format: The midterm and final exams will be based upon the material covered in lecture, labs, and the assigned reading. The exams will consist of a combination of multiple choice and short answer questions covering the lecture material and several short essay questions based on the reading assignments. There will also be a lab component to the exam covering the technical aspects of application development.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Wednesday, March 26, 2014.

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<table>
<thead>
<tr>
<th>Lecture Dates</th>
<th>Lecture Topics</th>
<th>Lab Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 15</td>
<td>Introduction (course logistics and topics)</td>
<td>1 No Lab</td>
</tr>
<tr>
<td>22</td>
<td>The Internet, WWW and GIS</td>
<td>2 ArcGIS Explorer and ArcGIS Online</td>
</tr>
<tr>
<td>27</td>
<td>Technical Basics- Server/Client, GIS Servers and Webpages</td>
<td>3 Profile Page</td>
</tr>
<tr>
<td>29</td>
<td>Geospatial Web Services</td>
<td>4 Profile page with map</td>
</tr>
<tr>
<td>Feb 03</td>
<td>Web service standards and geospatial mashups</td>
<td>5 Publish a web service</td>
</tr>
<tr>
<td>05</td>
<td>Publishing Web services</td>
<td>6 Working with Web map services</td>
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<td></td>
<td></td>
<td>Assignment 1</td>
</tr>
<tr>
<td>10</td>
<td>Introduction to Geospatial Mashups</td>
<td>7 Identify with Basemap selector Sample (three</td>
</tr>
<tr>
<td>12</td>
<td>Geospatial Mashups with external Sources</td>
<td>Layers)</td>
</tr>
<tr>
<td>17</td>
<td>Geospatial Mashups with tools.</td>
<td>8 Final map with layout</td>
</tr>
<tr>
<td>19</td>
<td>Geospatial Mashups with tools contd.</td>
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<tr>
<td>24</td>
<td>Geospatial mashup Layout and Design</td>
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<tr>
<td>26</td>
<td>Geospatial mashup Layout and Design contd.</td>
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<tr>
<td>Mar 03</td>
<td>Review</td>
<td>9 Create a mashup</td>
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<tr>
<td>05</td>
<td>EXAM 1</td>
<td>10 Continue Mashup Exercise</td>
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<tr>
<td>10</td>
<td>Creating Web Mapping Apps (Adobe Flex API)</td>
<td>11 Continue Mashup Exercise</td>
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<tr>
<td>12</td>
<td>Final Project Discussions</td>
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<td>Spring Break -- no class</td>
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<tr>
<td>24</td>
<td>Creating Web Mapping Apps (Adobe Flex API)</td>
<td>13 Flex APIs, Building a Mapping Application</td>
</tr>
<tr>
<td>26</td>
<td>Creating Web Mapping Apps (Other Available APIs)</td>
<td>14 Continue Building Application</td>
</tr>
<tr>
<td>Apr 02</td>
<td>Creating Web Mapping Apps (Other Available APIs)</td>
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<tr>
<td>07</td>
<td>Finalize Web Mapping Applications -- Other Available APIs</td>
<td>15 Working with GIS tools</td>
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<td>09</td>
<td>Geoportals</td>
<td>16 Incorporation Other Services</td>
</tr>
<tr>
<td>14</td>
<td>Introduction to Mobile Mapping Applications</td>
<td>17 Wrapper for Applications</td>
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<tr>
<td>16</td>
<td>Mobile Mapping Applications contd.</td>
<td>18 Finalize the Application</td>
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<tr>
<td></td>
<td>Student Holiday - no class</td>
<td>Assignment 3</td>
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<tr>
<td>21</td>
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<td>23</td>
<td>Future of Internet Web Mapping and GIS</td>
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<tr>
<td>28</td>
<td>Final Project Discussion</td>
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<td>30</td>
<td>Final Review</td>
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<tr>
<td>May 05</td>
<td>Final Project Presentations</td>
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<td></td>
<td>Individual Study Day -- no class</td>
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<tr>
<td>10</td>
<td>EXAM 2 – May 10th, 4:30 p.m. to 7:00 p.m.</td>
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</tbody>
</table>
GEOG 3335, Intersession 2014
Field Seminar in Physical Geography
Texas Tech University Campus at Junction
Dr. Jeff Lee

GEOG 4335 is an introduction to field research in physical geography. Through projects, we will cover the basics of field data collection and analysis. This is an intensive class: we will work all day, everyday, except for Sundays (afternoon only)

Schedule
Day 1: Topographic maps and tour of campus (introduction); pacing and compass use: delineating an orienteering course (error in measurements)
Day 2: Closed traverse mapping with compass and pacing (more on error)
Day 3–8: Mapping with GPS: vegetation map of campus, including base map (organizing group data collection, data conversions, graphics software)
Day 9: Topographic mapping with level and tape (contour lines)
Day 10: Trip to Mason Mountain Wildlife Area
Day 11-12: Topographic profiling with surveyor’s level and tape (using levels, more on error).
Day 13: Sediment sampling (simple statistics)
Day 14-15: Longitudinal profile of S. Llano River (organizing large group)

Each project will include a written report by each student explaining what was done and presenting and interpreting the results (map, graphs, etc.). In addition, each student will keep a scientific notebook, explaining in detail, how each project was done.

Grading
1. Participation (involvement in the projects and care in which work is done). 40%
2. Quality of project reports. 40%
3. Quality of the notebook. 20%

90 to 100% is an A, 80 to 89% is a B, 70 to 79% is a C, 60 to 69% is a D and below 60 % is a D.
GEOG 5304, Intersession 2014
Field Seminar in Physical Geography
Texas Tech University Campus at Junction
Dr. Jeff Lee

GEOG 5335 primarily involves independent, field-based research projects. This is an intensive class: we will work all day, everyday, except for Sundays (afternoon only)

Schedule (this is highly tentative as different projects require different timelines)
   Day 1-3: Preparing the project (identify topic, brief proposal)
   Day 4-10: Collect data
   Day 11-13: Analyze data
   Day 14-15: Write report

Grading
1. Proposal. 20%
2. Project report. 40%
3. Field notebook. 10%
4. Participation. 20% (assisting other students in their projects)

90 to 100% is an A, 80 to 89% is a B, 70 to 79% is a C, 60 to 69% is a D and below 60 % is a D.

Learning Outcomes: Upon completion of this class, a student should be prepared to identify a research problem, prepare a research proposal, collect and analyze data, and write up the report in the style of a journal article.

Assessment: The learning outcomes will be assessed by the quality of the proposal and project report.

Special Needs: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from
Fall 2013: GEOL 4300: Introduction to Petroleum Systems

Time: 9:00-9:50 am, MWF
Location: Science 204
Instructor: Prof. J. Horita (juske.horita@ttu.edu)
Office Hours: MWF 10-11 am or by appointment (Science 216)

Prerequisite: GEOL2303 Earth Materials and GPH2333 Introduction to Geophysics. GEOL3402 Structural Geology and GEOL4325 Sedimentology & Stratigraphy desired.

Course Objectives:
The purpose of the course is to provide students with general and updated background knowledge of petroleum geosciences. Topics to be covered include generation and migration of petroleum, geologic controls of oil and gas reservoirs, reservoir properties, sedimentary basins and petroleum systems, reservoir characterization, and methods of petroleum exploration. Unconventional resources (tight and heavy oil-gas in shales and sands, coalbed methane, gas hydrates) will be covered with select examples of oil-gas plays.

Textbook
Other relevant materials will be distributed.

Expected Learning Outcomes
1. Understand the origin of hydrocarbon reservoirs, relationship between sedimentary basins and petroleum systems, and generation and migration of petroleum by geologic processes such as sedimentation, erosion, tectonic movement, and diagenesis.
2. Understand the geologic control on the reservoir quality and quantity as well as general methods to characterize oil and gas reservoirs from geologic perspective.
3. Understand basic geophysical and geologic methods for petroleum exploration and exploitation.

Methods to Assess Learning Outcomes
Student achievement will be assessed on the basis of two mid-term exams (each worth 30% of total grade), and one final exam (40% of total grade). Prior to each examination, sample questions will be reviewed in class. Following examinations, answers will be reviewed in class. Class discussions will be used throughout the course to assess progress in learning and to review unclear concepts.

Grading
The final grade will be based on the total of grades that are earned according to the following guidelines: A=90-100; B=80-89; C=70-79; D=60-69.

Exam Schedule
Mid-term Exam 1 – Monday, 9/30/2013
Mid-term Exam 2 – Wednesday, 10/30/2013
Final Exam -7:30 a.m. to 10:00 a.m. Tuesday, December 10
Note: The dates of Mid-term exams are subject to change

General Topics
1. Introduction
   Historical review of petroleum exploration.
2. What is Petroleum?
   Chemical and physical properties
3. The subsurface environment
   Rock / Fluids / Dynamics
4. The petroleum system
   Formation of petroleum
   Migration and accumulation
   Types of traps
   Petroleum system
5. Exploration
   Well Drilling and Completion.
   Formation Evaluation.
   Geophysical Methods of Exploration.
   Exploration Process
6. Petroleum production
   Reservoir Characterization-Drives / Resources, Reserves, Risk
7. Unconventional Resources
8. Prospect Evaluation and Risk Analysis.
9. The future of the Petroleum Industry

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Civility in the Classroom: Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, students should not engage in any form of
distraction. Inappropriate behavior in the classroom will result, minimally, in a request to leave class.

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Fall 2013: GEOL 5300: Introduction to Petroleum Systems

Time: 9:00-9:50 am, MWF
Location: Science 204
Instructor: Prof. J. Horita (juske.horita@ttu.edu)
Office Hours: MWF 10-11 am or by appointment (Science 216)

Prerequisite: GEOL2303 Earth Materials and GPH2333 Introduction to Geophysics. GEOL3402 Structural Geology and GEOL4325 Sedimentology & Stratigraphy desired.

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   - Types of traps
   - Petroleum system
5. Exploration
   - Well Drilling and Completion.
   - Formation Evaluation.
   - Geophysical Methods of Exploration.
   - Exploration Process
6. Petroleum production
   - Reservoir Characterization-Drives / Resources, Reserves, Risk
7. Unconventional Resources
8. Prospect Evaluation and Risk Analysis.
9. The future of the Petroleum Industry

Academic Honesty & Integrity: From OP 34.12: “It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. “Scholastic dishonesty” includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.”

Access: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as possible to make necessary arrangements. Students must present appropriate verification from Student Disability Services during the instructor’s office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

Civility in the Classroom: Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, students should not engage in any form of
distraction. Inappropriate behavior in the classroom will result, minimally, in a request to leave class.

Student Absence for Observance of Religious Holy Day: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.
FALL 2013
GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY
GIST 4308: CARTOGRAPHIC DESIGN

Dr. Kevin Mulligan
Office: 208 Holden Hall
Office Hours: MW 1:00 - 2:00 p.m. or by appointment.

Lecture/Lab: TuTh 12:30 - 2:20 p.m.
Phone: (806) 834-0391
Email: kevin.mulligan@ttu.edu

Course Objective: The purpose of this course is to learn more about the cartographic process and expose students to the challenges and intricacies of creating publication quality maps. Topics in this course will cover the fundamentals of map design, distortion on maps, visual communication, principles of color, typography and data quality.

Prerequisites: Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GIST 3300/5300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:

1) understand and explain the concepts of generalization and abstraction in modern-day mapping,
2) understand common map projections and apply the appropriate projection in different mapping scenarios,
3) understand how people perceive color and pattern symbolization and apply these concepts in map projects,
4) apply cartographic design fundamentals, such as layout balance and visual hierarchy to map projects,
5) create publication quality maps that are both accurate and visually appealing,
6) understand and apply the different cartographic requirements for presentations, posters and publications
7) understand and apply the cartographic principles used in Internet mapping.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, two class projects, and a final project. The exams will be used to assess your understanding of the basic concepts introduced in the course. You are required to complete each of the lab assignments, but they will not be graded. Your ability to work through these assignments will be used to assess your cartographic skills, learning outcomes 2-5. The class project and final project are designed to further develop your advanced cartographic skills and will be used to assess learning outcome 6-8.

Grading: The midterm and final exams are each worth 50 points. The two class projects are worth 50 points each, and the final project is worth 50 points. Your final grade is therefore based on a possible total of 250 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab: You are required to enroll in the lab for GIST 4308.

Required USB Flash Drive: To save your lab assignments and projects, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 2 GB flash drive is recommended.

Lab Assignments: You are expected to complete each of the lab assignments during the scheduled lab class time. Ten points will be deducted for each missed lab assignment.

Exam Format: The midterm and final exams will consist of a combination of multiple choice, short answer and short essay questions. The exams will be based upon the material covered in lecture and reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013.

Disability Statement: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact me as soon as possible to make any necessary arrangements.
# FALL 2013

## TENTATIVE CLASS SCHEDULE

### GIST 4308: CARTOGRAPHIC DESIGN

<table>
<thead>
<tr>
<th>LECTURE</th>
<th>LAB</th>
<th>TOPIC</th>
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</thead>
<tbody>
<tr>
<td>AUG 27</td>
<td>01</td>
<td>Introduction</td>
</tr>
<tr>
<td>29</td>
<td>02</td>
<td>A Brief History of Cartography</td>
</tr>
<tr>
<td>SEP 03</td>
<td>03</td>
<td>The Cartographic Process</td>
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<tr>
<td>05</td>
<td>04</td>
<td>Map Design Fundamentals</td>
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<tr>
<td>10</td>
<td>05</td>
<td>Distortion in Coordinate Systems and Projections</td>
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<td>12</td>
<td>06</td>
<td>Choosing a Map Projection</td>
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<td>17</td>
<td>07</td>
<td>Modern Typography</td>
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<tr>
<td>19</td>
<td>08</td>
<td>Labels and Annotation in ArcMap</td>
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<tr>
<td>24</td>
<td>09</td>
<td>Scale: Generalization and Abstraction</td>
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<tr>
<td>26</td>
<td>10</td>
<td>Data Sources: Admin Boundaries and Transportation</td>
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<td>OCT 01</td>
<td>11</td>
<td>Data Sources: Hydrography and Soils</td>
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<td>03</td>
<td>12</td>
<td>Data Sources: Elevation</td>
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<tr>
<td>08</td>
<td>13</td>
<td>Principles of Color and Pattern</td>
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<td>10</td>
<td>14</td>
<td>Color Theory/Color Blindness</td>
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<tr>
<td>15</td>
<td>15</td>
<td>EXAM 1 *Exam Review*</td>
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<td>NOV 05</td>
<td>20</td>
<td>20 Map Animation</td>
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<tr>
<td>07</td>
<td>21</td>
<td>3D Representations</td>
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<tr>
<td>12</td>
<td>22</td>
<td>Geovisualization: Entities and Attributes</td>
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<td>14</td>
<td>23</td>
<td>Geovisualization: Quality and Uncertainty</td>
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<td>19</td>
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<td>21</td>
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<td>26</td>
<td>26</td>
<td>Future of Cartography</td>
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<tr>
<td>28</td>
<td>27</td>
<td>Thanksgiving Holiday — no class</td>
</tr>
<tr>
<td>DEC 03</td>
<td>27</td>
<td>Final Project: \textit{Presentations}</td>
</tr>
<tr>
<td>05</td>
<td>27</td>
<td>Individual Study Day — no class</td>
</tr>
</tbody>
</table>

*EXAM 2 - Friday December 6, 10:30 a.m.*
FALL 2013

GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY

GIST 5308: CARTOGRAPHIC DESIGN

Dr. Kevin Mulligan
Office: 208 Holden Hall
Office Hours: MW 1:00 - 2:00 p.m. or by appointment.

Lecture/Lab: TuTh 12:30 - 2:20 p.m.
Phone: (806) 834-0391
Email: kevin.mulligan@ttu.edu

Course Objective: The purpose of this course is to learn more about the cartographic process and expose students to the challenges and intricacies of creating publication quality maps. Topics in this course will cover the fundamentals of map design, distortion on maps, visual communication, principles of color, typography and data quality.

Prerequisites: Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GIST 3300/5300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:

1) understand and explain the concepts of generalization and abstraction in modern-day mapping,
2) understand common map projections and apply the appropriate projection in different mapping scenarios,
4) understand how people perceive color and pattern symbolization and apply these concepts in map projects,
5) apply cartographic design fundamentals, such as layout balance and visual hierarchy to map projects,
6) create publication quality maps that are both accurate and visually appealing,
7) understand and apply the different cartographic requirements for presentations, posters and publications
8) understand and apply the cartographic principles used in Internet mapping.

Assessment: There are two exams in this course (a midterm and a final), lab assignments, two class projects, and a final project. The exams will be used to assess your understanding of the basic concepts introduced in the course. You are required to complete each of the lab assignments, but they will not be graded. Your ability to work through these assignments will be used to assess your cartographic skills, learning outcomes 2-5. The class project and final project are designed to further develop your advanced cartographic skills and will be used to assess learning outcome 6-8.

Grading: The midterm and final exams are each worth 50 points. The two class projects are worth 50 points each, and the final project is worth 50 points. Your final grade is therefore based on a possible total of 250 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab: You are required to enroll in the lab for GIST 5308.

Required USB Flash Drive: To save your lab assignments and projects, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 2 GB flash drive is recommended.

Lab Assignments: You are expected to complete each of the lab assignments during the scheduled lab class time. Ten points will be deducted for each missed lab assignment.

Exam Format: The midterm and final exams will consist of a combination of multiple choice, short answer and short essay questions. The exams will be based upon the material covered in lecture and reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013.

Disability Statement: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact me as soon as possible to make any necessary arrangements.
<table>
<thead>
<tr>
<th>LECTURE</th>
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<tr>
<td><strong>AUG</strong></td>
<td>01</td>
<td>Introduction</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
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<tr>
<td>29</td>
<td>02</td>
<td>A Brief History of Cartography</td>
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<tr>
<td>04</td>
<td>3</td>
<td>Map Interpretation: USGS Symbology</td>
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<td><strong>SEP</strong></td>
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<td>Map Design Fundamentals</td>
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<td>Quantitative Maps: Alternatives</td>
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<td>Quantitative Maps: Choropleth Maps</td>
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<td>6</td>
<td>Working with Projections</td>
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<td>07</td>
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<td>Intro to Maplex Label Engine</td>
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<td>Generalization in ArcMap</td>
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<td>09</td>
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<td>Working with Roads</td>
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<td><strong>OCT</strong></td>
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<td>County Natural Resource Project</td>
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<td>16</td>
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<td>Maps for Power Point</td>
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<td>Maps for the Web</td>
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<td>Non-traditional Maps</td>
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<td>19</td>
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<td>Perspective Cartography</td>
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<td>Final Project: Getting Started</td>
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<td>12</td>
<td>Final Project: Obtaining Your Data</td>
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<td>18</td>
<td>24</td>
<td>Final Project: Analyzing Your Data</td>
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<td>21</td>
<td>25</td>
<td>Final Project: Final Map Design</td>
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<tr>
<td>22</td>
<td>26</td>
<td>Final Project: Final Map Production</td>
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<td>28</td>
<td>27</td>
<td>Final Project: Presentations</td>
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<tr>
<td><strong>DEC</strong></td>
<td>03</td>
<td>Thanksgiving Holiday – no class</td>
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<tr>
<td>05</td>
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<td>Final Project: Presentations</td>
</tr>
<tr>
<td>06</td>
<td>06</td>
<td>Christmas Holiday – no class</td>
</tr>
</tbody>
</table>

**FALL 2013**
**TENTATIVE CLASS SCHEDULE**
**GIST 5308: CARTOGRAPHIC DESIGN**

**EXAM 2 - Friday December 6, 10:30 a.m.**
FALL 2013
GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY
GIST 4310/5310: GPS FIELD MAPPING AND DATA ACQUISITION

Santosh Seshadri
Office: 123 Experimental Sciences Building
Office Hours: MW 2:00 - 3:00 p.m. or by appointment.

Lecture: MW 3:00 - 3:50 p.m.
Lab: MW 4:00 - 5:00 p.m.
Phone: 806-834-1146
Email: santosh.seshadri@ttu.edu
Class Website: http://gis.ttu.edu/gist4310/

Course Objective: Modern field mapping technology uses the Global Positioning System (GPS) to capture the location of point, line and area features - and collect the attributes associated with those features. In this course you will learn how GPS works, how to use mapping-grade GPS receivers, how to use mobile mapping software, how to apply differential corrections to your field data, and how to plan and manage a field mapping project. In addition this course will also cover basic crowd sourcing technologies and how to develop GPS applications.

Prerequisites: Working knowledge of the Microsoft Windows environment and ArcGIS. These requirements can be fulfilled with GIST 3300 or an equivalent course with department approval.

Learning Outcomes: After completing this course, students will be able to:

1) Understand the principles of global satellite navigation systems (GNSS)
2) Demonstrate a clear understanding of the GPS signal and issues with satellite positioning
3) Demonstrate basic proficiency to collect, record and process spatial data
4) Post-process GPS field data and perform differential corrections
5) Plan, manage and carry out a successful field mapping project - and document the process.

Assessment: There are two exams in this course (a midterm and a final), a series of field and lab assignments, and a final project that includes a written report. The exams will be used to assess learning outcomes 1 and 2. You are required to complete each of the field and lab assignments, but they will not be graded. Your ability to work through these assignments will be used to assess your field mapping and computer skills. The field assignments are designed to assess learning outcome 3 and the lab assignments are designed to assess learning outcome 4. The successful development of a final field mapping project and class presentation will be used to assess learning outcome 5.

Grading: The midterm and final exams are each worth 100 points and the final project is worth 100 points. Your final grade is therefore based on a possible total of 300 points. To ensure a grade in this course you must meet the following minimum requirements: A - 90%, B - 80%, C - 70%, D - 60%.

Required Lab: You are required to enroll in the lab for GIST 4310. Attendance in Lab is mandatory.

Required USB Flash Drive: To save your field and lab assignments and your final project, you will need a USB flash drive. Given that GIS data can take up a lot of space, a minimum 4 GB flash drive is recommended.

Field and Lab Assignments: You are expected to complete each of the lab assignments during the scheduled lab class time. Ten points will be deducted for each missed field or lab assignment.

Exam Format: The midterm and final exams will consist of two parts. First, a combination of multiple choice, short answer and short essay questions. And the second part will be a lab exam. The exams will be based upon the material covered in lecture, lab and reading assignments.

Make-Up Exams: You are required to take the exams at the scheduled times. Exceptions will be made in the case of a university approved excused absence.

Required Attendance: Attendance is required in both lecture and lab. An excused absence does not relieve you of meeting all of the course requirements. If you have any problems during the semester, please let me know.

Withdrawing: You are responsible for dropping the class. The last day to drop is Monday, October 28, 2013.
# FALL 2013
## CLASS SCHEDULE
### GIST 4310: MOBILE FIELD MAPPING AND DATA ACQUISITION

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<th>LAB</th>
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<td><strong>AUG</strong></td>
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<tr>
<td>26 Introduction (course topics and logistics)</td>
<td>Lab Setup</td>
</tr>
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<td>28 Reference Systems</td>
<td>Topographic Map Exercise</td>
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<td><strong>SEP</strong></td>
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<td>2 Holiday – no class</td>
<td>No lab</td>
</tr>
<tr>
<td>4 Principles of GPS (Trilateration)</td>
<td>Map Navigation Exercise</td>
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<tr>
<td>9 Principles of GPS Operation (PDOP, GDOP etc...)</td>
<td>Map and Basic GPS Navigation</td>
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<td>11 GPS Error Correction and Accuracy Issues</td>
<td>GPS Operations</td>
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<td>16 Differential Correction and Introduction to ArcPad</td>
<td>ArcPad Operations I</td>
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<td>18 Principles of ArcPad I</td>
<td>ArcPad Operations II</td>
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<td>23 Principles of ArcPad II</td>
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<td>ArcPad Field Exercise II</td>
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<td>30 Importing and Exporting Data to and from ArcGIS</td>
<td>Import and Export to ArcGIS</td>
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<td>02 ArcPad Extension for ArcGIS</td>
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<td>07 GPS Post Processing</td>
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<td>09 GPS and Maps</td>
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<td>14 <strong>EXAM 1</strong></td>
<td><strong>LAB EXAM 1</strong></td>
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<tr>
<td>16 Planning Data Collection</td>
<td>Working with Almanacs and Planning Tools</td>
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<td>21 Data Collection on a Laptop or Tablet Computer</td>
<td>Geocaching</td>
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<td>No Lab</td>
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<tr>
<td>28 GPS and Mobile Applications</td>
<td>GPS on Phones and other Devices</td>
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<td>30 GPS Correct</td>
<td>Field Data Collection Demonstration</td>
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<td>04 Introduction to ArcSDE</td>
<td>ArcSDE Exercise</td>
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<td>06 ArcSDE Implementation</td>
<td>Export GPS Data to Google Earth</td>
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<td>11 ArcSDE and Final Project</td>
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<td>13 ArcSDE and Final Project Contd.</td>
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<tr>
<td>18 ArcSDE and Final Project Contd.</td>
<td>Final Project</td>
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<tr>
<td>20 Crowdsourcing</td>
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<td>25 Creating Open Source Crowd Mapping Applications</td>
<td>Finalize Crowdsourcing Application</td>
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<td>27 Holiday – no class</td>
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<tr>
<td><strong>DEC</strong></td>
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<tr>
<td>02 Final Project Presentations</td>
<td>Final Project Presentations</td>
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<tr>
<td>04 Final Review</td>
<td>Final Review</td>
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<tr>
<td>05 Individual Study Day – no class</td>
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<tr>
<td>06 <strong>EXAM 2</strong> - Friday, December 6th at 1:30 p.m.</td>
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</table>
**Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)**

Any student who, because of a disability, might require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements either at the beginning of the semester or upon diagnosis of disability. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

**Student Absence for Observance of Religious Holy Day (OP 34.19)**

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

**Academic Honesty & Integrity (OP 34.12)**

From OP 34.12: "It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

"Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act."
# Fall 2013
## CLASS SCHEDULE
### GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY
#### GIST 4304: ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

<table>
<thead>
<tr>
<th>LECTURE</th>
<th>LAB TOPIC</th>
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<tr>
<td>AUG 27</td>
<td>Lab 1 – Connect to Server / Review lab</td>
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<td>Lab 2 – Tutorial 1-1 Exercise 1-1</td>
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<tr>
<td>SEP 3</td>
<td>Lab 3 – Tutorial 1-2 Exercise 1-2</td>
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<td>Lab 4 – Tutorial 2-1 Exercise 2-1</td>
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<tr>
<td>10</td>
<td>Lab 5 – Tutorial 2-2 Exercise 2-2</td>
</tr>
<tr>
<td>12</td>
<td>Lab 6 – Map Projections</td>
</tr>
<tr>
<td>17</td>
<td>Lab 7 – Tutorial 3-1 Exercise 3-1</td>
</tr>
<tr>
<td>19</td>
<td>Lab 8 – Labels and Anno &amp; Tut 8-1 &amp; Tut 8-2</td>
</tr>
<tr>
<td>24</td>
<td>Lab 9 – Tut 4-1 Ex 4-1 &amp; Build File GDB</td>
</tr>
<tr>
<td>26</td>
<td>Lab 10 – Creating and Applying Domains</td>
</tr>
<tr>
<td>OCT 1</td>
<td>Lab 11 – Editing spatial data / Tut 4-2</td>
</tr>
<tr>
<td>3</td>
<td>Lab 12 – Editing tabular data / Ex 4-2</td>
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<tr>
<td>8</td>
<td>Lab 13 – Tabular Data Management</td>
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<tr>
<td>15 EXAM 1</td>
<td>All Assignments Due</td>
</tr>
<tr>
<td>17</td>
<td>Lab 14 – Symbolization &amp; Classification</td>
</tr>
<tr>
<td></td>
<td>Review</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>22 NO Lecture</td>
<td>Work on Final Project Proposal</td>
</tr>
<tr>
<td>24</td>
<td>Lab 15 – Georeferencing Tut 4-5 Ex 4-5</td>
</tr>
<tr>
<td></td>
<td>Draft Project Proposal Due</td>
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<tr>
<td>29</td>
<td>Lab 16 – Map Layouts</td>
</tr>
<tr>
<td>31</td>
<td>Lab 17 - Tutorial 5-1, Ex 5-1</td>
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<td></td>
<td>Final Project Proposal Due</td>
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<tr>
<td>NOV 5</td>
<td>Lab 18 – Tutorial 5-3 Ex 5-3</td>
</tr>
<tr>
<td>7</td>
<td>Lab 19 – Geoprocessing &amp; Analysis</td>
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<td>12</td>
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<td>14</td>
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<tr>
<td>19</td>
<td>Lab 20 – Sharing Data</td>
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<td>20</td>
<td>Lab 21 – Customizing / Tut 6-1 / Ex 6-1</td>
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<td>21</td>
<td>Lab 22 – Final Projects</td>
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<td>Lab 23 – Final Projects</td>
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<td>All Lab Assignments Due</td>
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<td>26</td>
<td>Lab 24 – Final Projects</td>
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<td>28 Thanksgiving Holiday</td>
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<td>DEC 3</td>
<td>Lab 25 – Final Projects</td>
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<tr>
<td>5</td>
<td>FINAL PROJECT DUE</td>
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<tr>
<td>09 EXAM 2</td>
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<td>7:30 – 10:00 am</td>
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</table>
Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (OP 10.08)
Any student who, because of a disability, might require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements either at the beginning of the semester or upon diagnosis of disability. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405.

Student Absence for Observance of Religious Holy Day (OP 34.19)
1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Academic Honesty & Integrity (OP 34.12)
From OP 34.12: "It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

"Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act."

Safety Procedures
In the event of a fire alarm or building alarm that is not for a tornado students should follow the instructor to the exit that has been established in the building safety document. To exit students should proceed to the right of the room, down the hall to the exit doors facing east. Students should proceed to the south east and wait by the fire stairs outside the xx building until the all clear has been sounded.

In the event of a tornado students should follow the instructor along the hall that runs north of the class room, then to the nearest stairway that leads to the basement.
Techniques and Applications in Mineral Sciences
GCH 5308
Spring 2014
Dr. Callum J. Hetherington
Sci. Building Rm 127
callum.hetherington@ttu.edu
Office Hours: By appointment
Lectures: MWF 11:00-11:50

This course will provide a review of basic concepts in crystallography and mineralogy and develop a practical understanding of the concepts and techniques used in mineralogy and crystal chemistry, with a particular focus on their application to naturally occurring materials.

Learning outcomes. At the end of the course, the student should:
1. Use the nomenclature and terminology used in mineralogy, crystal chemistry and mineral science.
2. Demonstrate the application of modern qualitative and quantitative techniques in mineralogy.
3. Interpret quantitative and qualitative data collected by analytical techniques in mineralogy.
4. Describe and explain the most common structural features of silicate and non-silicate minerals.
5. Describe the crystal-chemical causes of common compositional variations in silicate minerals,
6. Interpret the significance of mineral stability and structure as a function of composition.
7. Describe and interpret mineral textures arising from solid-state reactions in minerals.
8. Interpret the energy transitions and changes that cause solid solution and exsolution reactions.
9. Differentiate between thermodynamic and kinetic processes in mineralogy.
10. Identify and describe transformation processes in mineralogy.
11. Explain the causes and consequences of transformation processes in mineralogy.

Methods for assessing expected learning outcomes:
1. Students will demonstrate accurate use of terminology during lecture and laboratory discussions (LO1)
2. Maintenance of a reading list that describes and summarizes an average of four scientific publications relevant to the topic being studied each week (LO 3, 4, 5, 8, 9, 10, 11).
3. Preparation of a literature review essay that describes and summarizes a topic of directly relevance to your field of research (LO 1, 4, 11).
4. Present comparisons between two or more contrasting or conflicting scientific publications in lecture.
5. Present the results of a personal research-related study project (LO 2, 3, 4). 
6. Preparation of a term-paper summarizing the results of an independent project (LO 1-11).

Prerequisites: Permission of instructor.


Grading

To complete and pass the course each component must be completed. The components are:

Completion of practical assignments and problem sets (60%).

Completion of activities associated with personal research project: literature review, data collection, presentation (Department Research Day) and report (30%).

Maintenance and presentation of bibliography and reading list, relevant to lecture content, containing a broad diversity and spectrum of references (10%).
Students are expected to attend lecture and participate in discussions. Failure to participate or complete any of the course components will endanger your successful completion of the course. "Make-up" procedures will be at the discretion of the teaching team and may be written, practical or viva.

Grades (A through C) will be awarded based on the following scale.
A = 70-100%; B = 60-69%; C = 50-59%; D = 40-49%; F = <39%.

Academic Integrity Policy

Plagiarism and academic misconduct will not be tolerated. Examples of violations with regard to this course include copying and/or using another students' homework or extra credit material (from this or previous semesters), plagiarizing and/or failing to cite references for projects, and copying or using unauthorized materials during quizzes/exams. Ignorance of the academic integrity policy is not an acceptable excuse and will not exempt you from being subject to its ramifications. See Student Handbook, 2004-2005, Code of Student Conduct, Part IX, Section B item number 3 of the following website: http://www.depts.ttu.edu/studentjudicialprograms/PDF-WordFiles/IntegrityMatters.pdf if you have further questions.

ADA Statement

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

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2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.
3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Course Outline and Overview

The course will be broadly based on the textbook: Andrew Putnis (1992) Introduction to Mineral Sciences, Cambridge University Press. A copy of it is not required, but may prove valuable if you have an interest in pursuing mineralogically oriented research. A copy for the library has also been requested.

In addition to the textbook students must be prepared to investigate other resources, including text books and journal publications.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Review of Minerals and Mineralogy</td>
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<tr>
<td></td>
<td>Practical Task</td>
<td>Radiation Safety Training</td>
</tr>
</tbody>
</table>
2 Practical Tasks
Crystallography, periodicity and symmetry
Introduction to XRD instrument and protocol write up.
Space groups and stereographic projections

3 Practical Tasks
Anisotropy and physical properties of minerals
2-page review on mineral anisotropy

4 Practical Tasks
Powder X-ray Diffraction
Phase identification in a mixed powder

5 Practical Tasks
Electron Microscopy
Introduction to SEM and electron optics

6 Practical Tasks
Electron Microscopy and crystal morphology
Secondary electron imaging

7 Practical Tasks
Electron microscopy and compositional studies
Back-scatter electron microscopy and interaction volumes

7 Practical Tasks
Energy Dispersive Spectroscopy
Compositional analysis by SEM

8 Practical Task
Spectroscopic methods in mineralogy
What do IR and Raman spectra patterns look like?

9 Practical Task
Spectroscopic methods continued
What do IR and Raman spectra patterns mean?

10 Practical Task
Packing and structures in minerals
Prepare literature review for personal study project

11 Practical Task
Crystal chemistry, solid-solutions and phase diagrams
Phase diagram interpretation

12 Practical Task
Transformational processes in minerals
Preparation of personal research activity presentation

Requirements for successful completion of the course include

1. Class attendance and participation
2. Weekly assignments
3. Development of a personal project proposal
4. Literature review related to proposal
5. Personal project write-up
6. Presentation of project
7. Maintenance of bibliography
Geography 3360  Technology and the Human Landscape  Spring 2010
Linda Jones
Office Hours: M 9-10, W 1-2, F 10-11 or by appointment
Office Phone: 742-2466 ext. 245  Holden Hall 213
Email: linda.jones@ttu.edu

Materials
Science and Technology in World History: An Introduction by McClellan and Dorn
An atlas (student’s choice)  Additional articles presented by the instructor.

Grading
Your grade in this course is based on 3 exams, and 2 research papers. Exams will be take home essay exams. Each will require correct citations. The exams are not cumulative. There is no final exam. Each assignment is worth 100 points and your grade will be based on your cumulative average.

The 2 research papers will be 6-8 pages on topics selected by the student. Each must be double-spaced, typed in Times New Roman 12 and include a cover sheet with name and title. A bibliography and proper citations are required.

The first paper will center on an ancient technology (prior to the European Renaissance) not discussed in class and will include the origin and purpose of the technology, its geographic diffusion and its impact on the human and physical landscape.

The second paper will center on a modern technology (The European Renaissance to the present) not discussed in class. It must include the origin and purpose of the technology, its geographic diffusion, its impact on the human and physical landscape, unintended consequences and future use.

Course Competencies
Technology and Applied Science
The objective of the study of the technology and applied science component of a core curriculum is to enable the student to understand how profoundly scientific and technological developments affect society and the environment and to demonstrate understanding of the relationship of ethics and technology Human/Environment interaction, one of the five themes of Geography is viewed as critical to one’s understanding of and interactions with today’s world. Geography 3360 fulfills this objective by looking at specific examples of human adaptation to and modification of the environment. We will also look at how humans and the environment are interdependent. We will look across time and space to do this.

Multicultural Requirement
The objective of the multicultural requirement is to introduce the student to the different ways of perceiving, analysing . interpreting and interacting with our world used by different groups of people. In this course we will explore the relationship between culture and technology, examine cultural factors in adoption or rejection of technology and explore the interface between cultural values and technology.

**Learning Outcomes**

1. Define technology and human landscape as geographic concepts

2. Explain human/environment interactions in terms of adaptation, modification and dependence

3. Interpret human development as a technological process

4. Explain specific technologies (like mathematics, architecture, agriculture, animal and plant domestication, fire, irrigation and language) in terms of impact on the environment.

5. Think critically to analyse technological impacts (intended and unintended consequences like global climate change, ethical dilemmas like genetic testing and future developments like sustainable energy)

6. Analyse technology from scientific, ethical, social and environmental viewpoints.

7. Interpret maps to gain information on origins, diffusions and current locations of various technologies

8. Recognize the importance of Non-Western technologies

9. Explain the dispersal patterns of various technologies based on cultural values

10. Illustrate the impact of various technologies on cultural development

**Assessments**

1. In class discussion and each of three exams

2. Each exam and a major focus of each of two research papers

3. Major component assessed on first exam essay questions.

4. In class discussion and each of three exams.

5. In class discussions, each exam and a major component of each of two research papers.

6. In class discussions, each exam and a major component of each of two research papers.

7. Assessment included in each research
8. In class discussions and essay questions on each of three exams.

9. Each research paper and each exam will assess this.

10. This is a part of each of three exams and each of two research papers.

Attendance

Class attendance is expected and has a strong correlation with a good grade. You are responsible for all material covered in class, including videos. If you miss an exam, you must let me know right away and make arrangements to take the test.

There will be no make-up exams unless you have missed an exam for a University-approved reason. Don’t schedule medical appointments during class time. I recommend that you exchange emails, phone numbers & good calling times with 2 or 3 classmates in case of absence.

Tardiness: Arrive to class on time. Avoid entering class late; it causes a distraction and is inconsiderate to your professor and classmates.

If your professor does not let you out of your previous class on time, let me know and I’ll be glad to contact him/her. Being late during the semester will affect your grade in this class.

Absences due to religious observance: A student may be excused from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student whose absence is excused for this purpose may not be penalized for that absence and shall be allowed to take an exam or complete an assignment from which the student is excused.

Absence due to officially approved trips: The Bulletin of Texas Tech states that the person responsible for a student missing class due to a trip should notify the instructors of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

Academic Honesty: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. Complete honesty is required of students in the preparation and presentations of any and all phases of course work, as their own. This applies to quizzes of whatever length as well as to final examinations or any other homework or completed assignment. The attempt of students to present as their own any work not honestly performed is regarded by
the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. "Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Civility in the Classroom: Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor; students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class. Examples of inappropriate behavior include cellular phones and beepers, hostile or excessively aggressive behavior towards other students or the instructor, excessive tardiness, leaving class early, making offensive remarks, prolonged chattering, reading newspapers during class, sleeping, talking out of turn, arriving late to class, dominating discussions, overt inattentiveness, etc.

Students With Disabilities: Any student who, because of a disability, may require special arrangements in order to meet course requirement should contact the instructor as soon as possible to make any necessary accommodations. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. Disability status is confidential and should be discussed in private with the instructor once you have completed the appropriate Student Disability Services verification procedures.

Student Use of Personal Technology: Cell phones, pagers and other devices that might ring or otherwise introduce a distraction must be turned off. The making or receiving of phone calls during class is prohibited (except in the cases of emergency). Students must leave the classroom if this requirement is disregarded. The use of a notebook computer or similar electronic or digital device, for any purpose, including note taking, is subject to the approval of the instructor. No personal electronic device should ever be utilized during quizzes, examinations, or any testing or assessment situation unless specifically authorized by the instructor. Utilizing a personal technology device during class can result in a zero grade for participation, and any usage or attempted usage during any type of testing will result in a failing grade for that test.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>Jan. 13-15</td>
<td>Introduction</td>
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<tr>
<td>Jan. 18-22</td>
<td>Early human activity</td>
<td>Chapter 1</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Chapter</td>
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<tr>
<td>Jan. 25-29</td>
<td>Domestication</td>
<td>Chapter 2</td>
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<tr>
<td>Feb. 1-5</td>
<td>Ancient Egypt</td>
<td>Chapter 3</td>
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<td>Feb. 8-12</td>
<td>Ancient Greece</td>
<td>Chapter 4</td>
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<td><strong>Feb. 15</strong></td>
<td><strong>Exam #1</strong></td>
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<td>Feb. 15-19</td>
<td>Ancient Middle East</td>
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<td>Feb. 22-26</td>
<td>Ancient East</td>
<td>Chapter 5</td>
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<tr>
<td><strong>Mar. 1</strong></td>
<td><strong>Paper #1 due</strong></td>
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<tr>
<td>Mar. 1-5</td>
<td>Ancient South Asia</td>
<td>Chapter 6</td>
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<td>Mar. 8-12</td>
<td>New World</td>
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<td><strong>Mar. 15-19</strong></td>
<td><strong>Spring Break</strong></td>
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<td>Mar. 22-26</td>
<td>Ancient Europe</td>
<td>Chapter 7</td>
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<td><strong>Mar. 29</strong></td>
<td><strong>Exam #2</strong></td>
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<td>Mar. 29-Apr. 2</td>
<td>Scientific Revolution</td>
<td>Chapter 8</td>
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<td>Apr. 5-9</td>
<td>Continued</td>
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<td>Apr. 12-16</td>
<td>Industrial Revolution</td>
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<td>Apr. 19-23</td>
<td>Modern Science</td>
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<td><strong>Apr. 26</strong></td>
<td><strong>Paper #2 due</strong></td>
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<td>Apr. 26-30</td>
<td>Modern Science Continued</td>
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<td>May 3-4</td>
<td>Today and the Future</td>
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<td><strong>May 10</strong></td>
<td><strong>Exam #3</strong></td>
<td>Chapter 9</td>
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GEOL 5001 – 001  
Summer I, 2014  
Advanced Techniques in Electron Microscopy and Micro-Analysis

Regular Meeting Time: Monday/Wednesday 10:00-11:30, Room 226, Science Building

Callum J. Hetherington, Ph.D. Dept. of Geosciences:  
Email: callum.hetherington@ttu.edu

**Prerequisite: Permission of instructor.**

**Lecture Schedule and Practical Assignments:**

The course content and schedule has been summarized in the table below. Lectures scheduled to be given on Mondays will be followed up by laboratory practical session on the Wednesday or Thursday, with concepts cover in Wednesday lectures covered in practical sessions on Monday and Tuesday.

IMPORTANT: Some lectures will conclude with an assignment that is highly relevant and specific to the next laboratory. You are expected to complete the assignment prior to arriving for your scheduled laboratory session. Failure to provide evidence of having attempted, or completed, the assignment, may result if you being asked to leave the laboratory session as you will be inadequately prepared to complete the practical tasks.

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Lab (Wed/Thurs)</th>
<th>Lab (Mon/Tues)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Field emission theory and operation of 4300</td>
<td>Sample exchange and routine operation of 4300</td>
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<tr>
<td>1</td>
<td>Low voltage SEM</td>
<td>Low voltage experiments</td>
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<tr>
<td>1</td>
<td>VP SEM</td>
<td>Variable Pressure Experiments</td>
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<tr>
<td>2</td>
<td>kV, current, ionization and excitation volume</td>
<td>BSE and EDS detectors</td>
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<tr>
<td>2</td>
<td>Theory and practical limitations of EDS</td>
<td>Spectral acquisition and processing</td>
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<tr>
<td>3</td>
<td>Quantification, matrix effects and errors</td>
<td>Map acquisition and processing</td>
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<tr>
<td>3</td>
<td>CL emission and detectors</td>
<td>Independent Group Project Time</td>
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<tr>
<td>4</td>
<td></td>
<td>Independent Group Project Time</td>
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</table>

**Expected learning outcomes:** Students will be competent in the operation and necessary routine alignments and operation of the Hitachi S-4300 SE/N analytical FESEM. Students will have been provided the intellectual, theoretical, and applied tools to critically think through problems associated with observing and analyzing samples in the variable pressure field emission scanning electron microscope (VPFESEM).

**Memory:** With the increasing number of users, image files are increasingly encumbering the computers associated with the electron microscopes, both past and present. Since image or analytical files tend to be rather large, the computers will be cleared of files twice a year. You are, therefore, responsible for removing your files of interest and storing them. IMAGES WILL NOT BE ARCHIVED ON IC COMPUTERS. As a result, transferring images from one computer to another has become a requirement, for the sake of both efficiency and convenience. It is HIGHLY recommended that you dedicate a USB memory device to this course and transfer your images to your personal computer/electronic archive.
Attendance:
100% attendance of both lectures and scheduled laboratory/practical sessions is required in this course.

Grading
Success in this course should not be viewed in terms of a letter grade. Successful completion of this course will be gaining permission to be an independent user of the S-4300 SE/N microscope and its detector technology – in the first stage either during the day or with the assistance of fellow students, and later, as a full independent user with after-hours and weekend privileges.

Gaining permission to be an independent user is based on you showing engagement with the course material and practical assignments and earning the trust to use the instrument with minimal risk to yourself or the microscope.

Due Dates: Assignments will be due at the beginning of the laboratory assignment for which they were designed; late assignments will not be accepted unless prior permission has been granted due to exceptional circumstances.

Instrument scheduling: The instrument has been reserved for the exclusive use of students in this course every afternoon between 12:00 and 5:00 pm, Monday through Thursday for the month of June. In the first lecture session practical-groupings will be identified and your two 2-hour per week practical sessions scheduled.

Thereafter, reservations for the instrumentation will be made through the Imaging Center website: http://biol.ttu.edu/EMlab/.

Assessment of Expected Learning Outcomes: This course deals with both the theoretical and applied or practical aspects of high resolution, analytical, variable pressure scanning electron microscopy, in particular the Hitachi S-4300SE/N. Because the required prerequisite course, Biology 6408, Research Techniques in Electron Microscopy, covered and tested the pertinent theoretical aspects of electron microscopy, this will not be assessed in this course. Rather, competence in the application and use of the Hitachi S-4300SE/N to a student’s particular research interests and/or requirements will be stressed. Each student will generate several series of mounted and annotated images (micrographs), to show the progress of that student throughout the semester. These images will reflect the various imaging and analytical aspects of the S-4300SE/N including variable pressure, backscatter imaging, high-resolution SE imaging, X-ray microanalysis, Quartz PCL, and where appropriate, CL imaging. These images are reflective of the competence of the student and each set builds on the skills of the previous image sets as the semester progresses. Students are encouraged to show and discuss these assignments with the instructor and students in the course during lecture sessions.

Lecture Room Etiquette
It would be helpful to everyone, and will greatly improve the quality of the learning environment, if you could bear in mind a few things when attending lecture.

1. Please make every effort to be punctual to class. If you do arrive late please use the open seat closest to your point of entry.
2. After arriving, please try not to leave the lecture room until the end of the lecture session. It disrupts the learning environment.
3. Please turn off and put away all mobile phones and pagers etc and do not use them in the lecture room unless specifically instructed to do so. If your electronic devices interrupt or disturb the lecture you will be asked to leave.
4. Please remove all earphones/earbuds etc. The use of other electronic devices such as cameras, laptops, tablets and PDA’s is strongly discouraged for pedagogic reasons (please see document on “Using Electronics” on the course web page).
5. Digital recording (dictaphones etc) of the lecture is encouraged if you think it will be beneficial.
6. Refrain from chatting, dozing, texting etc. You may be asked to leave if you persist with such activities.
7. Personal discussions on technical points of a geological nature are welcome, so long as the rest of the class is invited to participate. Personal conversations will be actively discouraged.

**Academic Integrity Policy**

Plagiarism and academic misconduct will not be tolerated. Examples of violations with regard to this course include copying and/or using another students homework or extra credit material (from this or previous semesters), plagiarizing and/or failing to cite references for projects, and copying or using unauthorized materials during quizzes/exams. Ignorance of the academic integrity policy is not an acceptable excuse and will not exempt you from being subject to its ramifications. See Student Handbook, 2004-2005, Code of Student Conduct, Part II, Section B of the following website: [http://www.depts.ttu.edu/dos/docs/Student%20Handbook%202011-2012.pdf](http://www.depts.ttu.edu/dos/docs/Student%20Handbook%202011-2012.pdf) if you have further questions.

**ADA Statement**

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

**Student Absence for Observance of Religious Holy Day (OP 34.19)**

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.
2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.
3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.
Graduate Program Reviews

FACULTY AND STUDENT SURVEY RESULTS

**College:** Arts and Sciences  
**Department:** Geosciences  
**Conducted by:** Institutional Research & Information Management

December 2015

**FACULTY SURVEY RESULTS –**

Number of faculty participated in survey

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>9</td>
</tr>
<tr>
<td>Assoc. Professor</td>
<td>7</td>
</tr>
<tr>
<td>Asst. Professor</td>
<td>6</td>
</tr>
<tr>
<td>Emeritus</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
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<tr>
<td><strong>PARTICIPANT TOTAL</strong></td>
<td><strong>27</strong></td>
</tr>
<tr>
<td>Q-1</td>
<td>The facilities and equipment available to teach graduate courses are adequate.</td>
</tr>
<tr>
<td>Q-2</td>
<td>I have adequate access to facilities and equipment needed for my graduate work.</td>
</tr>
<tr>
<td>Q-3</td>
<td>The quality and availability of departmental graduate student office space is adequate for my needs.</td>
</tr>
<tr>
<td>Q-4</td>
<td>Library resources available to me are adequate.</td>
</tr>
<tr>
<td>Q-5</td>
<td>Teaching resources (faculty, teaching assistants) are adequate to my needs.</td>
</tr>
<tr>
<td>Q-6</td>
<td>The program offers an adequate selection of graduate courses, sufficient for timely completion of a full graduate program.</td>
</tr>
<tr>
<td>Q-7</td>
<td>The graduate courses available are taught at an appropriate level and are of sufficient rigor.</td>
</tr>
<tr>
<td>Q-8</td>
<td>The graduate teaching by faculty in the program is of appropriate quality.</td>
</tr>
<tr>
<td>Q-9</td>
<td>Graduate courses in other fields, needed to support your program or minor, are sufficiently available.</td>
</tr>
<tr>
<td>Q-10</td>
<td>There is adequate communication about policy and program changes in your department.</td>
</tr>
<tr>
<td>Q-11</td>
<td>There is adequate communication from the upper administration regarding policy changes.</td>
</tr>
<tr>
<td>Q-12</td>
<td>I am satisfied with the professional interaction with faculty throughout TTU.</td>
</tr>
</tbody>
</table>
Q-13 Graduate courses in other fields, needed to support your program(s) or minors, are sufficiently accepted.

<table>
<thead>
<tr>
<th>8</th>
<th>10</th>
<th>6</th>
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<tbody>
<tr>
<td>3.92</td>
<td></td>
<td></td>
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</table>

Q-14 Graduate courses in other fields, needed to support your program(s) or minors, are sufficiently recommended by your advisor(s).

<table>
<thead>
<tr>
<th>8</th>
<th>9</th>
<th>5</th>
<th>4</th>
<th>0</th>
<th>1</th>
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<tbody>
<tr>
<td>3.81</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Q-15 I am receiving the research and professional development guidance I need from other faculty.

<table>
<thead>
<tr>
<th>8</th>
<th>8</th>
<th>3</th>
<th>4</th>
<th>3</th>
<th>1</th>
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<tbody>
<tr>
<td>3.54</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Q-16 I am satisfied with the professional interaction with the graduate program coordinator(s).

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>10</th>
<th>8</th>
<th>5</th>
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<td>2.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q-17 I am satisfied with the professional interaction with other faculty within the program(s).

<table>
<thead>
<tr>
<th>3</th>
<th>10</th>
<th>9</th>
<th>2</th>
<th>1</th>
<th>2</th>
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</thead>
<tbody>
<tr>
<td>3.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q-18 I am treated as a respected contributor to the graduate program in which I am involved.

<table>
<thead>
<tr>
<th>2</th>
<th>10</th>
<th>8</th>
<th>6</th>
<th>0</th>
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<tr>
<td>3.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q-19 I have been given an opportunity to be engaged in decisions regarding changes in the program(s).

<table>
<thead>
<tr>
<th>3</th>
<th>12</th>
<th>6</th>
<th>5</th>
<th>0</th>
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<tr>
<td>3.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q-20 Course and program changes are evaluated by all faculty and voted upon by those faculty.

<table>
<thead>
<tr>
<th>1</th>
<th>9</th>
<th>9</th>
<th>6</th>
<th>0</th>
<th>2</th>
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<tbody>
<tr>
<td>3.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FACULTY COMMENTS:

What do you consider to be the strengths of your graduate program(s)?

flexibility, high-caliber research agendas of SOME faculty - thankfully, those with whom I appreciate collaborations, reasonably successful federal funding over 16 years, mostly exceptional graduate students (I'm specifically speaking of my and a few collaborator's students, but by no means the Department's graduate students in total), good mentoring that is honest, often, reasonably balanced, and with high expectations.

Small, such that greater attention is paid to each student.

Students have access to a wide range of state-of-the art analytical equipment and labs. Research projects available to students are, or can be, of high quality and can lead to publication. Most of the faculty are enthusiastic about student mentoring and most do a good job of it.
Diversity in course offerings, general strength - academic, intellectual and research focus - of faculty supervising graduate students, number of teaching assistantship stipends (if not their value), institutional support to expand number of graduate students.

The department is relatively well rounded in terms of expertise, providing a good range of possible research areas for graduate students to pursue.

Well rounded training of master's degree students.

Rigorous coursework that satisfies the necessary requirements for employment in the discipline. Active involvement of students in publishable and funded research.

Our course has a strong demand among undergraduate and graduates.

Everyone is pretty free to do what they want research wise and there are not too many issue with big egos and turf.

Strong faculty in ATMO, GEOL, and GPH. These attract high quality students.

The quality of graduate students that we attract, which then results in good TAs and a very friendly and cooperative group.

Faculty have generally cooperated to provide the best education for graduate students. Considerable expense has been purposed toward analytical facilities that offer a promise of improved programs in geochemistry.

Young, enthusiastic, productive faculty.

Faculty are active, research is healthy, facilities are unique, student play a significant role in activities.

Tie with petroleum industry / Requirement of thesis project for Master degree.

no comment.

Prior to this year we had some strength in geospatial technology. Although all of our graduate courses were piggy-backed with undergraduate sections, overall the program was quite strong.

Most of our faculty want to work with our graduate students and give a lot of their time and attention.

It is not very strong.

Ms students are getting jobs in the profession.

None.

Breadth of courses. Opportunities for field training.

There are not any strengths that I can think of.

fairly gapped arcuate program but more stress to petroleum-related disciplines.

The course offering for students who seek employment in the oil industry.

As a part time instructor for undergraduates I am not well acquainted with the graduate program.
The ATMO graduate program is particularly strong because it is focused specifically on aspects of regional interest (wind, severe storms, etc.); the graduate programs in GEOL and GPHY provide good 'general' training and seek to cover all disciplines, but would benefit from focusing instead on fewer sub-disciplines within those fields.

**What changes, if any, could be made to improve the quality of your graduate program(s)?**

<table>
<thead>
<tr>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>More state funding for stipends and tuition/fees, an additional faculty member in my sub-discipline (there is only one and I serve ~80 majors and ~180 COE majors every fall in a junior-level, lab based courses) so to alleviate the undergrad teaching load, better facilities and in particular a new building</td>
</tr>
<tr>
<td>I think the quality of the faculty is the main thing, and as long as we all are productive, the program quality should be high.</td>
</tr>
<tr>
<td>We routinely lose most of the best applicants to schools that offer larger stipends and do not charge tuition or fees. This situation will continue until Tech enters the 21st century. We need at least two additional faculty members in soft-rock-related fields to develop a true concentration that would attract top-flight students. The infrastructure of GEOL (except ATMO) is, politely put, awful. The Science Building was constructed for early 20th century science education, not research. It is difficult/impossible to renovate for modern lab research. Moreover, if we are to add more graduate students to the program, we need office space, computer access, and lab space for their research activities. Acquisition of analytical equipment during the past 10 years has improved our visibility among colleagues and therefore among their students. However, TTU seems to be unable to recognize that maintenance and operation of these labs is as important as their existence. Nevertheless, no component of the university is willing to assist in lab support (e.g., service contracts, technical personnel). This lack means that labs ultimately fail, and their ability to gain and keep visibility fails, too.</td>
</tr>
<tr>
<td>Time - from a graduate program perspective, too much of my time is spent in the undergraduate program and handling a diversity of University administrative details without appropriate compensation, either financial or in-kind support. I also suffer from lack of appropriate administrative oversight of some important facilities that hinders timely completion of research projects and data collection, and in a related theme, there is a shortage of institutional support to help maintain and operate laboratories and core facilities around campus. Everything is done on a shoe-string budget. The general quality of our infrastructure is also a growing concern - we have nowhere to expand into, in terms of office or laboratory space, and because of program growth in recent years, we have probably reached the maximum number of graduate students the Department can accommodate because many research-active Faculty have reached the maximum number of students they are willing to supervise at any time (especially without a reduction in teaching loads in the under-graduate program, or increase in compensation and incentives).</td>
</tr>
<tr>
<td>It would be very helpful to have more faculty. For example, the geophysics program could use several more professors, to help expand graduate course offerings and areas of departmental expertise.</td>
</tr>
<tr>
<td>Proposal</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Higher quality MS students and more PhD students. Stipends to attract</td>
</tr>
<tr>
<td>more students with research assistantships</td>
</tr>
<tr>
<td>Where Graduate School programs in support of departmental needs exist,</td>
</tr>
<tr>
<td>ensure that they meet the needs identified by the faculty, not those</td>
</tr>
<tr>
<td>needs identified by administration as the most likely to result in</td>
</tr>
<tr>
<td>prestige. Faculty are best aware of the disciplinary and professional</td>
</tr>
<tr>
<td>specifics of their area, and especially where the faculty have</td>
</tr>
<tr>
<td>demonstrated success, this awareness should be honored.</td>
</tr>
<tr>
<td>We lost couple of people in the past years. I hope we could have one or</td>
</tr>
<tr>
<td>two lecturers to help on the undergraduate classes, and the faculty</td>
</tr>
<tr>
<td>could have more time to develop more graduate level courses and direct</td>
</tr>
<tr>
<td>graduate students.</td>
</tr>
<tr>
<td>More coordination in designing a set of graduate classes that are</td>
</tr>
</tbody>
</table>
Modernize classroom and teaching laboratory space and equipment. Increase number of graduate student teaching assistantships.

First and foremost -- more faculty. There are only four faculty members and only three of us work with graduate students. This means that there are very few courses for graduates students to take (most are piggy backs of undergrad courses) and very few options in terms of faculty to work with.

Some courses on environmental and paleoclimate change

More course offering for PhD-level students.

n/a

See response to previous question.

Please feel free to add any additional comments or questions in the space below.

Many of our graduate programs are highly data-intensive. Nevertheless, the Grad School still requires theses and dissertations to be in print-ready format; essentially a 19th century construct. Instead, the Grad School should be encouraging students to present data in modern, computer-readable formats. This issue is especially pertinent considering the new Federal requirements concerning data presentation, storage, and transmission. There is a need for the Grad School to survey all departments concerning best recruiting practices. This effort should be used to revamp the GEEP program, to make it more effective, predictable, and equitable. There is no one-size-fits-all approach to graduate recruiting, yet the Grad School seems to think that there is.

The graduate program would probably benefit considerably by the offering of meaningful tuition support by the university itself. Numerous graduate programs in Texas seem to offer this kind of support, which can allow graduate students to focus to a greater extent on their research.

The department still function somewhat in the dark where new classes and policies appear and are assumed to be "what we always did" without faculty vetting or voting. But then that may be how the consenses preferes it in our department. So I am not sure changing this would help but on some level it seems a bit annoying. But changing it may be more annoying.

Some of the most experienced and highly qualified research faculty in our department decline to supervise graduate student research, especially at the PhD level. Although our program has historically been strong in areas of interest to the energy industry, a major source of jobs for our graduate students, investment in facilities and faculty has drifted away from these areas. Now, our own best undergraduates seek graduate programs elsewhere because of limited opportunities here. The energy industry is also starting to look for hires at other universities. The growth in some areas (e.g., geochemistry) has been at the expense of areas like sedimentary geology and geophysics. Although some of this has been passive drift, in some instances, management practices have caused this (local funding; technical support). The argument has been that greater research funding and an increase in

Geosciences
graduate enrollment would result, but it is not clear that this has been the result. / / Graduate faculty can have inequitable teaching loads (actual course taught; excluding balancing loads by assignment of labs not supervised by the faculty member). / / / / / 

1) We have never had a champion for the Geography Program as Department Head or Dean. As such, the discipline has languished as a stepchild for more than 20 years, first with the Department of Economics & Geography and now with Geosciences. When I first came to Texas Tech, I knew Geography was small (4 faculty), but I looked at this as a great opportunity thinking that I could play a significant role in the development, direction and growth of the program. Unfortunately, that never happened and I have been extremely disappointed. I would be ecstatic if just one administrator (Department Head, A&S Dean, Graduate School Dean, VPR or Provost) ever attended an Esri User Conference. / 2) The quality of the undergraduate and graduate programs in Geography is severely hampered by the limited number of faculty. Over the past year or two we have seen a 25-30% reduction in the number of Geography FTEs. At the same time we continue to see strong growth in our GIST courses, growth that has persisted now for more than 15 years. / 3) It is very difficult to operate as a department when we are spread across campus. The social and profession interaction that comes with proximity is desperately needed for the department to function coherently as a unit.

I think that policies and procedures from the GRAD College are opaque and little understood. There is essentially no communication from them to the department and our graduate students.

None

Recruitment of better graduate students is linked in many instances to growth of faculty research facilities. But infrastructure development at TTU is limited by the availability of appropriate laboratory space.

The truth is that we are doing a great disservice to our graduate students and we probably should not have a graduate program.

overall it's a good program
STUDENT SURVEY RESULTS – BIOLOGICAL SCIENCES

Number of students participating in survey

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral</td>
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<tr>
<td>Master’s Thesis</td>
<td>42</td>
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<tr>
<td>Other</td>
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<tr>
<td><strong>PARTICIPANT TOTAL</strong></td>
<td><strong>61</strong></td>
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<table>
<thead>
<tr>
<th>Student participant: Years in program</th>
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<tbody>
<tr>
<td>1&lt;sup&gt;ST&lt;/sup&gt; year</td>
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<tr>
<td>2&lt;sup&gt;ND&lt;/sup&gt; year</td>
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<tr>
<td>3&lt;sup&gt;RD&lt;/sup&gt; year</td>
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<tr>
<td>4&lt;sup&gt;TH&lt;/sup&gt; year</td>
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<tr>
<td>5&lt;sup&gt;TH&lt;/sup&gt; year</td>
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<td>6&lt;sup&gt;TH&lt;/sup&gt; year</td>
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**SCALE**

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<tbody>
<tr>
<td>Q-1  The research facilities and equipment available for my graduate research meet my needs.</td>
<td>21</td>
<td>29</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>4.00</td>
</tr>
<tr>
<td>Q-2  I have adequate access to facilities and equipment needed for my graduate work.</td>
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<td>23</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4.13</td>
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<td>Q-3  The quality and availability of departmental graduate student office space is adequate for my needs.</td>
<td>33</td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>4.03</td>
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<td>Q-4  Library resources available to me are adequate for my needs.</td>
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<td>23</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4.39</td>
<td></td>
</tr>
<tr>
<td>Q-5  Teaching resources (faculty, teaching assistants) are adequate to my needs.</td>
<td>26</td>
<td>19</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4.00</td>
</tr>
<tr>
<td>Q-6  The program offers an adequate selection of graduate courses, sufficient for timely completion of a full graduate program.</td>
<td>20</td>
<td>29</td>
<td>6</td>
<td>4</td>
<td>3</td>
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<td>Q-7  The graduate courses available are taught at an appropriate level and are of sufficient rigor.</td>
<td>24</td>
<td>30</td>
<td>5</td>
<td>1</td>
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<td>Count of 5</td>
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<td>Q-8 The graduate teaching by faculty in the program is of appropriate quality.</td>
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<td>26</td>
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<td>4.24</td>
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<tr>
<td>Q-9 Graduate courses in other fields, needed to support my program or minor, are sufficiently available.</td>
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<td>19</td>
<td>13</td>
<td>2</td>
<td>0</td>
<td>11</td>
<td>4.00</td>
</tr>
<tr>
<td>Q-10 Program seminars are adequate to keep me informed of developments in my field.</td>
<td>17</td>
<td>23</td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>3.74</td>
</tr>
<tr>
<td>Q-11 The initial advising I received when I entered the program was an adequate orientation.</td>
<td>17</td>
<td>27</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>3.81</td>
</tr>
<tr>
<td>Q-12 I have a department mailbox or other form of communication with faculty &amp; graduate students.</td>
<td>22</td>
<td>29</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4.13</td>
</tr>
<tr>
<td>Q-13 I have adequate access to my major professor.</td>
<td>37</td>
<td>20</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4.45</td>
</tr>
<tr>
<td>Q-14 I am receiving the research and professional development guidance I need.</td>
<td>27</td>
<td>24</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4.16</td>
</tr>
<tr>
<td>Q-15 I am satisfied with the professional interaction with my major professor.</td>
<td>36</td>
<td>19</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4.37</td>
</tr>
<tr>
<td>Q-16 I am satisfied with the professional interaction with faculty both within the program and at TTU.</td>
<td>21</td>
<td>32</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4.13</td>
</tr>
<tr>
<td>Q-17 I am treated as a respected contributor to the research program in which I am involved.</td>
<td>23</td>
<td>31</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4.18</td>
</tr>
<tr>
<td>Q-18 I have been given an opportunity to be engaged in significant research for my thesis or dissertation.</td>
<td>31</td>
<td>26</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4.41</td>
</tr>
<tr>
<td>Q-19 If I decide to change my major professor, the mechanism for doing so is suitable.</td>
<td>11</td>
<td>12</td>
<td>17</td>
<td>2</td>
<td>4</td>
<td>15</td>
<td>3.52</td>
</tr>
<tr>
<td>Q-20 I am informed of opportunities for professional development and contacts outside TTU, such as attendance at professional meetings.</td>
<td>25</td>
<td>25</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4.13</td>
</tr>
<tr>
<td>Q-21 Graduate teaching or research assistantship stipends are adequate.</td>
<td>13</td>
<td>26</td>
<td>10</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>3.57</td>
</tr>
<tr>
<td>Q-22 The program offers adequate opportunity for its graduate students to gain teaching experience.</td>
<td>31</td>
<td>20</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4.23</td>
</tr>
</tbody>
</table>
STUDENT COMMENTS:

What do you consider to be the strengths of this program?

<table>
<thead>
<tr>
<th>The accessibility of the faculty and other graduate students. I never have a problem going to faculty or fellow students for help or support.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty rocks.</td>
</tr>
<tr>
<td>The program is very tightly knit, social, and collaborative. The ability for the graduate students to work together and solve problems together is the most beneficial experience to my graduate education. I have developed close relationships with many of the students and faculty beyond any that I had in my undergraduate education.</td>
</tr>
<tr>
<td>Organization and dedication to students</td>
</tr>
<tr>
<td>Extremely interactive faculty</td>
</tr>
<tr>
<td>The multidisciplinary aspect of research. I was also given complete freedom of research topic. I left another program to join this one due to this additional research freedom.</td>
</tr>
<tr>
<td>Access to computer labs</td>
</tr>
<tr>
<td>Current faculty are very knowledgeable and helpful. Their concern is concentrated on what is best for each individual graduate student, not their own prestige.</td>
</tr>
<tr>
<td>The faculty are exceptional. The courses are exceptional.</td>
</tr>
<tr>
<td>This program's strength is in it's diversity. We not only have the geography students, but students from all sorts of other programs. This makes it a wonderful learning experience, because we get to</td>
</tr>
</tbody>
</table>
learn about research that is going on in other programs, and what is expected in their programs, which helps us become more rounded, better students.

<table>
<thead>
<tr>
<th>Research facilities, course availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are easy ways to communicate with faculty in any question or concern related to research topics, or logistical issues with teaching duties.</td>
</tr>
<tr>
<td>The low number of fellow geophysics students means I have abundant access to research facilities and my graduate advisor. I am also able to get a TA position even though I joined the program with the expectation of being unfunded since the number of students eligible for being a TA in the related classes is so low.</td>
</tr>
</tbody>
</table>

| Diversity. There are classes to suit almost every specific area of interest. / Hospitality. Everyone that I've met in the department has been very warm and welcoming. / Research Equipment. The department has most of the equipment that a researcher would need in house. My undergrad had 1 XRD and that was about it, but here a lot of analysis can be done in the department. / Fellowship. There is a strong connection between students, faculty and staff that makes the department/program feel like a community. / Funding. The department is able to support a lot of grad students with a stipend to allow students to focus on school without having to work another job. / |
| This program thrives on the connectivity it has between each of the subprograms. I feel that I can approach anyone with questions regarding their specialty. |

| Research facilities and faculty at TTU are excellent |
| The superadvisor of mine is a great professor, all the resources in the department are good enough to help me accomplish my thesis, the teaching assistant job covered my tuition and living expense perfectly. |
| The strength of this program is having excellent faculty to guide/teach students. |
| Adequate funding and access to professors and research materials/equipment. |
| Hands on training with professors. Well connected to industry. Well known and well respected professors. |
| Interaction with industry standards. |
| The availability of resources is bountiful and advantageous. Professors are most willing to help as long as there are not previous engagements. I believe I have made the correct choice to have Texas Tech to give me my masters program. |
| Good for interaction among graduate and undergraduate students. Lab supervisors are very helpful |
| Really helpful staff. |
| The research facilities (radars, StickNet platforms, observing systems, etc.) and quality of faculty |
| 1. Courses: the classes I have taken have stimulated my interests and are sufficiently rigorous. / 2. Faculty: the faculty who teach the courses are knowledgeable and professional. Most of them have high expectations, but are still approachable. |
Professional, friendly and hard working faculty

I think it is an asset of the program to be affiliated with the petroleum industry.

Have full access with all faculty, they do help whenever they can.

My program is not clear

You are encouraged to explore your own research interests

The strengths of this program include the personal attention from the faculty, the hard work of the administrative staff, and the Graduate School seminars helping prepare you for job placement. Within the Department of Geosciences, there is a tightknit group of faculty that provide a rigorous, but supportive program. The program also encourages community involvement including traveling to meetings, and also provides financial support. The Graduate School seminars have been very helpful, for example, on how to write a research statement.

Most of the faculty in the department are top notch. I have a great relationship with my advisor and enjoy the research we are doing. There are also opportunities for field work.

Size. The one-on-one relationships between the faculty and students in the Atmospheric Science group is some of the best. Field opportunities. Every student seems to have a good chance at participating in field work at least once while in the program.

What do you consider to be the weaknesses of this program?

I'm not sure. Maybe it is too small, but I never had experience in a larger program, so I don't know what that is like.

We are shoved in a back corner of the university, segregated from the rest of the earth sciences. This seriously is a huge problem. If interdisciplinary work is encouraged, bring the ATMO department closer to the fluid dynamicists, astronomers, geoscientists, and physicists.

The program's weakness is the disconnect with the rest of campus and the direction of classes. The students are not encouraged enough to pursue classes outside of the program that more relate to their topics of interest. It is a hassle to get out of certain classes because the group expects all students to have very similar schedules. There should be more flexibility in scheduling or a change in the group's culture towards research-focus-oriented scheduling.

Knowing what to come in prepared with

Lack of staff and resources. A few of our professors are forced to take on secretary roles along with advising and teaching. This trickles down to the graduates and causes less time to focus on research.

Students using unethical and illegal means of retaliation against faculty, staff, and students go unpunished and a culture of fear is fostered.
Lack of faculty. Without enough funding/support from the University, there is simply not enough faculty to teach classes that will help graduate students excel (not just complete the "minimal" amount to graduate).

We have three students in the department who have behavioral issues. They are obnoxious, and repeatedly have to be sent to student conduct office. It is not fair that they get to continue behaving that way and disrupting the rest of us. Every time they get sent to student conduct is another time they have been permitted to continue their negative impact on the department.

A lot of our resources are old and slow. I have my own desk and have been given a computer, but it has never worked. I'm in my third semester, and I still haven't been able to use a computer in my office, which the vast majority of my homework and research requires computer programs. Also, during class, the computers we are using often break, meaning that there is always a computer that isn't working, so whoever is last to class does not get to use a computer to do the homework that day. The computers that do work are very slow and will often freeze or shut the programs down randomly. Since the majority of all the classes are computer based, GIS, Remote Sensing, and Spatial Analysis, this creates a huge problem.

Limited access to advisor at times

Sometimes there is vagueness in some of the courses taught, or a lack of structure.

Labs are made up every semester rather than following some established lab workbook or guide. Making these labs is very time consuming and I have had little time to work on research pertaining to my thesis. While I mentioned the low number of students previously as a boon, it is also a bit of an annoyance as there are only two students, myself and a now Ph.D. seeking student who is now a RA, who are readily available to answer questions related to coursework and labs. Lastly, while we have equipment for research purposes, most of it is at least 30 years old or older, sufficiently outdated that working with them is a hassle since they are not compatible with our newer computers.

The number of grad students is out of proportion to undergrads. Grad students often have to assist on field trips for classes they don't TA because there are so many undergrads in the department. This interferes with class/work/research, which I don't like. There is no communal computer lab for students to use. The undergrad geoscience curriculum at TTU is strong, so grads who move up from doing undergrad here are well prepared. I came from a different undergrad institution and there are deficiencies in my background that put me behind. Maybe professors shouldn't assume all students have the same experience, like working with a petrographic scope or working with ArcGIS.

I don't feel that I've come across any prominent weaknesses thus far. I've only been in the program for a couple months.

Space for such a large department is an issue

more funding both for research and facility will be better

The weakness of this department is not having the means to continue to grow as large as desired.

No major weakness, however availability of diverse classes can be improved upon.

NA
<table>
<thead>
<tr>
<th>Technology, software useful for extracurricular geological events</th>
</tr>
</thead>
<tbody>
<tr>
<td>The only fallacy I could ponder is why have not more students come to this program, and dedicated their time.</td>
</tr>
<tr>
<td>You have to jump through not-well established loopholes for conference funding.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>The computing resources (High Performance Computing Center, HPCC) are available but not well maintained. I have had numerous problems with the HPCC and available documentation to solve problems on my own as well as the information shared by staff to users of the system. The computing systems often fail, which should not be the case.</td>
</tr>
<tr>
<td>There are teaching assistants who do not take their jobs seriously. They consider interacting with undergrad students and/or grading materials a waste of time, an annoyance, and want to do the least amount of work to &quot;get by.&quot; This does a disservice to the undergrad students in the lab classes, and it makes the department as a whole look like we don't care. On the other hand, there are numerous grad students who care about the teaching aspect, prepare before they give lectures, and understand that this is a job that they are being paid to do. There are few repercussions for the students who slack. Perhaps if there was a more rigorous departmental orientation on how to be a TA (job description/duties, etc.), that might positively influence the attitudes of incoming TA's, most of whom have never taught a class or been responsible for student learning. Of course, this requires one of the professors to initiate such a program, and many do not have the time/energy for such things.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course requirements for research track PhD at Texas Tech are large compared to other similar structured universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The graduate TA office is way too small. The teaching assignment takes up a lot of time. The geophysics professors are not enough to teach all the courses, we urgently need more geophysics professors. More good courses to be taught.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My program takes much longer time</th>
</tr>
</thead>
<tbody>
<tr>
<td>The department cannot hire and keep quality faculty. The department is unfair and does not treat students equally in terms of research funding or teaching assignments. The department shows nepotism and extreme bias. Students are not motivated/provided the resources to finish in a timely manner. High performing students are not provided adequate research or teaching funding. Failure is rewarded. Assistantships are awarded based on personal opinions rather than merit or academic progress. There are not enough graduate courses offered. Faculty, especially in geography, are not engaged in research with students. All graduate courses I have taken are piggybacked with undergraduate courses. Computer facilities are outdated and not maintained. Stipends and TA positions are inadequate and unequal.</td>
</tr>
</tbody>
</table>

| One of the main weaknesses is the lack of Ph.D. students within our program. In larger institutions, the Ph.D. community is larger which provides a better network and support system between students. The defense deadline and the formating requests are very restrictive and compared to other Universities, very early. I have also been scolded by the Graduate School for filling out a form by hand instead of typing it out, but at the same time the form wasn't even on the graduate school website, I had to google it to find it. In addition, the program changes rules every year or so, |

Geosciences
especially something like enrolling over the summer. Or now enrolling for research credit. Before you could enroll on your own, then the administrative staff had to do it, now you have to get a certificate from the administratrive staff to sign up! It seems these types of issues should be simplified, making it easier to complete your degree requirements.

I do lots of computational research and the compute resources at TTU high performance computing center (HPCC) are limited. It is really frustrating to work on HPCC and I wish there was another alternative.

Atmospheric Sciences is not only physically distanced from the rest of the department, but seemingly an afterthought when it comes to most things.

### What changes, if any, could be made to improve the quality of this program?

- Actually, I wish that the ATMO group (currently located on the top floor of MCOM, which is cool nonetheless) was closer in location to other geosciences and natural sciences to communicate.
- Move the department into the geoscience building.
- More interdisciplinary efforts would make this program much stronger. Sometimes the atmospheric science group seems alone and disconnected from the other departments.
- Interaction between students and advisors
- Hire a general secretary to do copies, mail, and general paperwork.
- We need more students so recruitment
- Discipline or remove Jason Post, Sarah Johnsons and Joshua Sharkey from the program.
- Increase the faculty will increase the potential for more advanced and beneficial courses.
- more supportive of physical geography. There is minimal space and supplies to conduct experiments. Although there is all this funding going to human geography and GIS(they have a whole other department/section of a building)...that is amazing with nice furniture, fully updated, but it is unusable to the majority of the rest of the department, completely locked up with only keycard access that most of us don't have.
- More time with advisor, more rigorous timeline for research goals
- Provide some more structure and clear cut needs from professors in specific courses, rather than making such decisions "on the fly."
- I would say another geophysics professor that teaches more than one class a year, additional TAs, or both.
- I think this is a great department. The quality of my experience could be improved if the university built restrooms on the 3rd floor of the Science building, but otherwise I'm satisfied :)
I think having more funds to expand on various research topics would be helpful.

Stronger connections to industry. Geo oriented career fair.

Providing more background courses before jumping into advanced subject matter for students who didn't have that material at their school. And not an undergraduate class, a graduate level rigor of class that covers background material.

Instrument usage across different programs be more easily accessible.

better facilities

A higher degree of competency for the staff that operates and maintains the HPCC. Otherwise, this program is terrific

Institute a departmental orientation on how to be a TA, how to juggle classes/teaching & grading responsibilities/research! It can be a difficult wake-up call, particularly for students who are new to graduate school and who underestimate the rigor and expectations of our program here at TTU.

Hire more geophysics professors for sure and bigger space for grad students to work.

The department needs to hire more faculty and update its facilities, especially in geography. The department needs to identify clear policies as to evaluation, teaching positions, progress and expectations. These need to be updated and made accessible to all students. Allocation of funding needs to be made a transparent process involving all faculty. This should be an equitable process. Travel funding should be increased for doctoral students. Students exceeding 2 years for MS & 4 for PhD should have funding cut. The department needs to reward success, not failure. The department needs to recruit students from sources other than their own undergraduate programs. The program should not fund student travel to conferences if they are not presenting. I would also recommend that all policies, criteria and decisions are used equally and publicly. I would recommend that the department needs to recruit faculty engaged in research. I would stop the drama in the program.

More money would always help. The stipend is adequate, but lowering tuition to zero would be more competitive with other programs in the U.S. The Graduate School forms and deadlines should be simplified. Deadlines for defense dates and submission deadlines should be loosened. Also, I would make a much more clear process for qualifying for in-state tuition. Being from out of state, once I became a Texas resident, I applied to be considered for in-state tuition. However, I never understood the application process and never heard a final ruling, other then on my tuition bill still receiving out of state tuition waivers. How can it be that the state considers me a resident but the University does not? This is very important for those of us who have lost funding and therefore do not recieve tuition and fee waivers, and now have to pay out of state tuition.

If the atmospheric science program is ever to grow and become greater, anemphasis on developing relationships with undergraduate students and working to guide them to stay at Tech for their graduate work would definitely help. Too often are these students considered of "poor quality". The role of education is to help them become of better quality, and helping them achieve better quality falls squarely on the department.
Please feel free to add any additional comments below.

Many of the atmospheric science researchers use lab space out at the Reese Center. We need some on-campus lab space that is more accessible.

I really enjoy my thesis work and most of the work I have done in this program. I look forward to completing this program by next December.

I have had to take classes at other departments to successfully augment and proceed with my thesis. The classes I wanted to take were not offered. As an older working professional with 20+ years of international work experience, my work experience is marginalized and I am constantly infantilized and made to feel inadequate professionally and academically by a few faculty and staff. Those few, to include the lack of discipline of younger graduate students, has made my time in this department uncomfortable and I highly regret choosing this major over another.

Maybe not enough faculty to support all the students. Linda Jones is an exceptional advisor. Wish she was still the graduate advisor. Dr. Elbow is awesome but don't feel as comfortable around him. Dr. Lee is supportive, kind, and extremely smart. Dr. Cao is extremely kind, really smart, dedicated and always pushes everyone to do better (frustrating at times). Dr. Mulligan, very smart, great personality, always has time for students--has an amazing lecture class. Dr. Zhao is also very kind and crazy smart...wouldn't it make sense to hire him full time (for tenure)?...he is here and he is good, he is kind, he is dedicated, and his students learn.

N/A

While I was originally happy about getting funding, at this point I would rather pay out of pocket and seek some scholarships rather than be a TA given how time consuming it is every week.

Geology rocks. Have a gneiss day!

I have truly enjoyed my time in the Geosciences department. The faculty, and particularly the staff, have been exceptionally supportive. I have had the opportunity to teach several different lectures, and many different labs, an opportunity not extended to most grad students. Although this diverse teaching load has at times significantly side-tracked my research, I am well-prepared for pursuing a teaching position in academia when I graduate this coming May.

No

I would like the program evaluators to focus on two areas: funding allocation and faculty/student recruitment. We cannot seem to recruit nor keep high quality faculty and graduate students. Students are taking far longer than expected to graduate, especially in geography. Faculty are stretched thin, required courses are cut all the time because no one can teach them. Also, funding (travel, research and teaching) needs to be a public and transparent process. Right now we have MS students that are beyond their 2 years of funding, teaching lectures, while doctoral students with demonstrated performance and achievement are left behind. Decisions are clandestine and nepotism defines the program. No recruiting efforts are made for high quality graduate students. Graduate courses are
piggybacked on undergraduate courses and students are not encouraged to grow as academics, nor stimulated to generate feasible research projects. Travel funds are very scarce and are not allocated to deserving students. Graduate advising, at least on the MS Geography level is extremely lacking and insufficient. Politics and drama define the working environment. Many graduate students are not involved in research nor decisions that affect them. TAs are used to teach for faculty, and students are not encouraged to graduate on time. There are clear biases, resulting in motivated, high performing students to seek other programs to complete their degrees. I am greatly disappointed in the lack of graduate courses offered, as well as the amount of faculty in the geography program.

I am proud to be a red raider, but I feel the graduate program, especially the Ph.D. requirements can be simplified. In addition, rules like the 99 credit rule is very restrictive for Ph.D. students and laws like campus carry make me glad I am graduating and finding a job in another state. If this law was passed before I came to Tech, I would seriously reconsider coming here.