Texas Tech University  
Center for Biotechnology and Genomics

Fall 2019 Course Syllabus

Course Number: BTEC 5301 – 001  
Course Name: Introduction to Biotechnology  
Course Instructor: Jatindra Nath Tripathy  
Title: Research Associate Professor  
Office: EXPSC Room 103  
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Office hours: by appointment  
Course Schedule: T, TH, 10:00 – 11:20 am, EXPSC, Room 120

Course Description:
This course reviews the history and origin of biotechnology, its rich legacy and its progress overtime. It highlights the main development, the principles and concepts, and seminal events that advance our understanding in both theory and application in this field. It also offers a broad coverage of the fundamental aspects in chemistry, biochemistry, genetics, molecular biology, recombinant DNA technology, genomics and proteomics and their role on the emergence of modern biotechnology as an innovation in science and engineering.

Prerequisites:
Admission to MS biotechnology program/Bachelor’s degree in natural sciences/Consent of course instructor/ and above all a strong motivation to learn.

Required Texts:


Note: This is a required textbook. In addition, I will give you historical and current journal articles to read as needed.
Course Objectives and Expected Learning Outcomes:
By the end of the course, the fully prepared students should be able to:

✓ Describe the origin and history of biotechnology and its progress over time.
✓ Identify the contributions of many scientific disciplines to modern biotechnology.
✓ Define biotechnology and differentiate it from biology.
✓ Give examples of the historic and current application of biotechnology.
✓ Explain the fundamental principles of chemistry in life.
✓ Illustrate the atomic and molecular basis of life, biomolecules and their function.
✓ Explain the diversity and commonality of life.
✓ Illustrate Mendel’s laws of inheritance and chromosomal theory of inheritance.
✓ Explain the rationale of meiosis behind Mendelian and non-Mendelian inheritance.
✓ Explain how to use genetic mapping to establish gene location on the chromosome.
✓ Develop the gene concept.
✓ Describe DNA structure, how DNA replicates and maintains its fidelity.
✓ Describe how genome evolves, how genome transcribes and translates to proteins.
✓ Describe strategies to clone, purify, analyze and map gene.
✓ Summarize the steps to construct recombinant DNA.
✓ Describe the application of recombinant DNA technology and how it is use to manipulate gene.
✓ Describe how to make transgenic plants and animals.
✓ Devise strategies to mutate gene and editing the genome.
✓ Describe the motivation behind Human Genome Project.
✓ Describe the scientific approach and technology used to sequence, assembled the first Human Genome, and the lesson learned from the first Human Genome Project.
✓ Describe the progress and achievements since the completion of first Human Genome Project.
✓ Analyze the convergence revolution in science for further innovation.

Assessments:
Learning outcome will be assessed by following criteria:

✓ Reading assignments - 20%
✓ Three one-hour exam. (9/12, 10/17, 11/14) - 45% (equally distributed)
✓ Comprehensive final exam (12/7; 7:30 a.m. – 10:00 a.m.) - 25%
✓ Class participation - 10%

**Reading Assignment:**
Reading assignment will be available in Mc-Graw-Hill’s Connect through Blackboard. Every week, several chapters from your textbook will be assigned to you to read and the credits will be given for your work if it is completed by the due date. **Once the due date passes, you will receive NO credit for that assignment.** However, you can still access the chapters to study.

**Examination:**
Exam questions will be based on topics discussed in lecture, book chapters and assigned reading materials. Exams will cover multiple choice, short answer; fill in the blank types of questions. There is NO makeup exam.

**Class Participation:**
Students are expected to engage in learning in the class by actively taking notes, sharing your thoughts and ideas, participating in-class discussion, asking and answering questions and debating respectfully with your classmates and instructor.

**Electronic Gadgets Use Policy:**
Cell phones, pagers and any other audio and video recording devices are not allowed to use during class. Cell phones must be kept in silent mode during class. No phone use including texting is permitted during class. You should leave the class if you want to use your phones for emergency purposes.

You may use your computer for note taking. I strongly recommend and encourage you to take notes (writing notes than typing notes) during lecture. Research shows that students perform better both in their learning and test when they take notes in writing (Mueller and Oppenheimer, Psychological Science, May 22, 2014 as doi:10.1177/0956797614524581).

**Grading:**
A final letter grade will be determined by performance on the above criteria, 90% and above –“A”, 80 to 89.9% - “B”, 70 to 79.9% - “C” and 60 to 69.9% - “D” and below 60% - “F”. A grade of “I” (Incomplete) will be awarded by the instructor prior to the end of the semester only when failure to complete the work has been due to causes beyond the student’s control and when class performance has been satisfactory. Texas Tech regulations require that a form explaining the reason for the incomplete and the method to be used to make up the missed work be submitted, after being signed by both the student and instructor, to the Registrar. Incomplete grades that are not replaced by an A, B or C grade within one year are automatically replaced by an F.

**To be successful in this course:**
✓ Attend every class (never miss a class unless it is an emergency).
✓ Take notes (writing notes, not typing) during lecture, ask question, stay focus during class and participate in in-class discussion.
✓ Maintain a daily study schedule for this course.
Prepare for every class in advance, complete reading assignments by due date.

Never hesitate to ask question.

Contact me well in advance if you have any questions related to course.

Attendance:
Lectures will include facts and discussion that may not be in the assigned-texts or handouts. It is therefore necessary and expected that you will attend and participate in every scheduled class. There are no makeup classes. If there is a reason for missing a class, you must contact me as soon as possible to make necessary arrangements to discuss the outcome of the absence. You may need to provide a note from your physician excusing your absence if you are absent from a class more than a day due to an illness.

Student Accessibility:
OP 34.22: 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.

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. Each student shall be responsible for his/her conduct. Students are expected to abide by all of the rules for academic integrity, as specified by the TTU Student Affair Hand Book (http://www.depts.ttu.edu/studentjudicialprograms/academicinteg.php). 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 not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student or the attempt to commit such and act”.

Cheating: Dishonesty in examinations, quizzes, or homework assignments, illegal possession of examinations, the use of unauthorized notes during an examination or quiz, obtaining information during an examination from the examination paper or otherwise from another student, assisting others to cheat, alteration of grade records, illegal entry to or unauthorized presence in an office are instances of cheating.

Plagiarism: Offering the work of another as one’s own, without proper acknowledgement, is plagiarism; therefore any student who fails to give credit for quotations or an essentially identical
expression of material taken from books, encyclopedias, magazines, internet web sites, and other reference works, or from the themes, reports or other writings of a fellow student is guilty of plagiarism.

**Civility in the Classroom:**
Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to ensure that all students have an opportunity to gain from time spent in class, unless otherwise approved by the instructor students are prohibited from using cellular phones or beepers or engage in any other form of distraction. Inappropriate behavior in the classroom will result in a request to leave the class.

**Religious Holy Day:**
By OP 34.19, 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.

**TTU Resources for Discrimination, Harassment, and Sexual Violence:**
Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/scc/ (Provides confidential support on campus.) TTU Student Counseling Center 24-hour Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, rise.ttu.edu (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931, http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)
Lecture Schedules:

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<tr>
<th>Lecture</th>
<th>Section/Book Chapters</th>
<th>Week</th>
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<tbody>
<tr>
<td></td>
<td><strong>Section A: Biotechnology, its origin and progress, Biochemistry</strong></td>
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| 1, 2    | Introduction: Concepts in Biotechnology  
          Cells: The fundamental units of life | 1    |
| 3, 4    | Chemical components of Cell, Biomolecules: Structure and Function | 2    |
|         | **Section B: Transmission Genetics, Biochemical Genetics, Population Genetics** |     |
| 5, 6    | **EXAM #1 (15% of Grade) – WEEK 1 and 2**  
          Chap.1. Overview of Genetics  
          Chap.2. Reproduction and Chromosome Transmission  
          Chap.3. Mendelian Inheritance | 3 9/12|
| 7, 8    | Chap. 4. Sex Determination and Sex Chromosomes  
          Chap. 5. Extensions of Mendelian Inheritance  
          Chap. 6. Extranuclear Inheritance, Imprinting and Maternal Effect  
          Chap. 7. Genetic Linkage and Mapping in Eukaryotes  
          Chap.8. Variation in Chromosome Structure and Number | 4    |
| 9, 10   | Chap. 22. Medical Genetics and Cancer  
          Chap. 23. Population Genetics | 5    |
| 11, 12  | Chap. 9. Genetics of Bacteria  
          Chap. 10. Genetics of Viruses | 6    |
|         | **Section C: Molecular Genetics, Molecular Biology, r-DNA Technology** |     |
| 13, 14  | Chap. 11. Molecular Structure of DNA and RNA  
          Chap. 12. Molecular Structure of Chromosomes and Transposition | 7    |
| 15, 16  | **EXAM #2 (15% of Grade) – WEEK 3, 4, 5 and 6**  
          Chap 13. DNA Replication and Recombination | 8 10/17|
| 17, 18  | Chap. 14. Gene Transcription and RNA Modification  
          Chap. 15. Translation of mRNA | 9    |
| 19, 20  | Chap. 16. Gene Regulation in Bacteria  
          Chap. 17. Gene Regulation in Eukaryotes | 10   |
| 21, 22  | Chap. 18. Non-coding RNAs  
          Chap. 19. Gene Mutation and DNA Repair  
          Chap. 20. Molecular Technologies | 11   |
|         | **Section D: Genomics, Proteomics and Bioinformatics** |     |
| 23, 24  | **EXAM #3 (15% of Grade) – WEEK 7, 8, 9, 10, and 11**  
          Chap. 21. Genomics | 12 11/14|
| 25, 26  | Chap. 24. Quantitative Genetics | 13   |
|         | Thanksgiving holiday week – No Lecture | 14   |
| 27      | Human Genome Project, Review for Final Exam. | 15   |
|         | **EXAM #4 Comprehensive Final EXAM (25% of Grade), Dec 7, 7:30 to 10:00 AM** | 12/7 |