

## **ChE 4020: Chemical Engineering Internship**

### **Course Syllabus: AY 23/24 & 24/25**

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**Course:** Che 4020: Internship

**Instructor:** Dr. Jeremy Marston

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**Office Hours:** By appointment only

**Location:** Dependent on internship

**Hours:** As agreed with instructor

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#### **Official Course description:**

Individual studies in chemical engineering through an industrial work experience.

#### **Other Course description:**

Work experience in an industrial environment in order to gain knowledge and skills to apply to remaining engineering courses for undergraduate programs in chemical engineering.

#### **Course Goals:**

This course is designed to enhance the undergraduate experience by providing the opportunity to engage in an industrial setting, learn new practical skills and/or research and design methodology.

#### **Credit Hours:**

Credit hours are assigned when students enroll, with the number of credits to be chosen by the student. Up to 3 credit hours can be applied to the Chemical Engineering degree plan.

#### **Enrollment Restrictions:**

Your internship must be with a company whose focus is engineering (preferably chemical). Otherwise, you will not be eligible to receive credit towards your CHE degree. To enroll, you must provide the following documentation:

- 1) A job description (with job title) clearly outlining your role and the nature of the company.
- 2) A completed internship form (available on the TTU Chemical engineering webpage here: [https://www.depts.ttu.edu/che/student\\_resources\\_forms.php](https://www.depts.ttu.edu/che/student_resources_forms.php))

Once these forms have been received and reviewed by the undergraduate committee, you will be notified of permission to enroll.

#### **Prerequisites & Required Training:**

Students are expected to be in the upper-division of the degree plan (i.e., rising juniors or seniors). If the work is laboratory based/hands-on field work, students will likely attend mandatory training provided by the employer. This training is expected to be documented in the final report, with any certificates added as an appendix.

**Learning Outcomes (assessed):**

The learning outcomes for this course, in alignment with the student outcomes (SO's) defined by the Accreditation Board for Engineering & Technology (ABET), are as follows:

- **Ability to communicate effectively with a range of audiences (ABET SO 3)**  
*Assessed by: (i) Layperson abstract/summary of the internship, (ii) Technical abstract of the final report, (iii) Presentation to faculty and sophomore students in CHE 2310/3315.*
- **Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (ABET SO 4)**  
*Assessed by: Depth and quality of the appropriate section of the final report covering economic, environmental and/or societal impacts of the work.*
- **Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (ABET SO 5)**  
*Assessed by: (i) Statements by the student in the report addressing teamwork, (ii) supervisor survey rating the student's teamwork.*
- **Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (ABET SO 6)**  
*Assessed by: Design of tests/experiments/field trials and depth of statistical analyses used, as documented in the final report.*
- **Ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (ABET SO 7)**  
*Assessed by: (i) Statements by the student in the report, detailing the new skills learned and how they were applied, (ii) supervisor survey rating the student's ability to adapt / pick up new techniques / skills where needed.*

**Required Documents & Assessment:**

Required documentation/Assessment	Weighting	Due Date**
Complete internship form and job offer/description	5%	1 <sup>st</sup> week of internship
Mid-semester update report (1-page)	5%	6 weeks prior to last day of class*
Submit documentation of all on-site training provided	5%	Last day of class*
Site supervisor survey	10%	Last day of class*
Student survey	10%	Last day of class*
Final report	50%	Last day of class*
Recorded video / zoom presentation to faculty / students	15%	End of semester*

\*As per TTU academic calendar for the semester you are enrolled.

\*\* No late submissions accepted. Any item not submitted by due date will receive a score of zero. All items submitted to blackboard, except for supervisor survey which can be submitted by email to the instructor of record.

## Report content:

Whilst the precise format, section titles/headings, and total length of the report are left to the student's discretion, it must be at least 10 pages, and contain the following elements:

1. **Cover page:** Stating your name, R-number, semester enrolled/dates of internship, credit hours, company name, Site supervisor, job title and location.
2. **Layperson's & Technical Abstracts: [1 page]** Two abstracts (1-2 short paragraphs) about the internship and work performed aimed at both (i) a "layperson" audience (i.e., those without a science or engineering background) that is jargon-free, and (ii) a technical audience (i.e., those with significant engineering background).
3. **Introduction: [~2 pages]** A general background of the business and technology of the industry or process with which they are involved. Business details might include general supply-demand discussion, production data, players and companies involved in the industry or using the process, the end use of the product or process.
4. **Role description: [~1 page]** A description of your role whilst working at the company, and a list of specific tasks/duties assigned.
5. **Technical details: [>5 pages]** A comprehensive discussion that illustrates how engineering and science-based analysis guided your decisions or recommendations. The report must include a *non-trivial amount of data* (real or simulated to avoid disclosure issues), detailed data analyses, properly referenced background on the data analysis, detailed graphs, schematics and other appropriate graphical presentations supporting your work and the decisions or recommendations that you made and should include estimates of error and statistical analysis. The report must discuss each figure or table, walking the reader through its significance. All estimates should be justified from scientific or knowledge-based reasoning. Technical details might include typical raw materials, generic processing steps, purification, safety, hazards, and end products or processes. For service work the report should describe the type of service provided, methods and techniques used by the service, rules, standards and regulations typical for the service and the end goal of the service.
6. **Statistical Analyses: [no set length]** Within the technical details or as a stand-alone section, detail the analyses run, example calculations/tests, and implications of the results for the work/processes.
7. **Global, Economic, Environmental, and/or Societal Impacts: [no set length]** Within the technical details or as a stand-alone section, discuss in detail how your work contributed to engineering solutions, and how they impacted the economy, environment of society (see the full description of ABET SO 4 above).
8. **Conclusion / Summary: [~1 page]** A summary of what was learned during the internship, new skills learned, and how the work performed will impact your future studies and career path.
9. **References / Appendices: [As needed]** List any cited literature and/or other sources of information used. If there are extensive tables of data or schematics (e.g., P&ID's) add them as an appendix. Also add any certificates/documentation of training and safety programs you took.

**Other Information:**

Graphics should be professional, presentation quality. Text should be error-free and use proper scientific grammatical construction.

It should be noted that the student may work with confidential information and the contents of their work report should be vetted by their supervisor or legal department of their sponsor prior to submission, to ensure no improper disclosures are made. Students who are unsure what information can and should be discussed should ask their internship sponsor or their supervisor. **It is the responsibility of the student to check first with their supervisor/company. In the event that you cannot submit an adequate report, you will not earn credit for the course.**

**Report Grading:**

Your report will be graded based upon the following sections, with a strict/clear rubric available via blackboard.

- Formatting and aesthetics
- Use of graphics
- Appropriate amount of technical details
- Communication with range of audiences (abstracts)
- Depth of statistical data analyses
- Consideration of impact of engineering solutions on economic, environmental or societal contexts
- Ability to acquire and apply new knowledge (conclusion/summary statements)
- References/bibliography

**Presentation to faculty and students:**

In addition to your report, you will present a summary (~10 minutes) of your internship experience to faculty and students that covers:

- The company you worked for, their general business area/business model, location, market cap, etc.
- Your role as an intern, teams you worked with, etc.
- Technical aspects of your work, i.e., details about what you did, and the engineering design/solutions you were part of
- Overall, what you learned from the experience, how your engineering courses may have helped prepare you, and advice for students seeking internships

**Grade boundaries:**

A: >90%, B: 81-90%, C: 71-80%, D: 61-70%, F: <60%