

# SYLLABUS - ENGR 220 - Statics and Mechanics of Materials

Interpretation and Alteration Policy: *The contents of this syllabus are not expected to change. However, the instructor retains the right to interpretation and/or alteration of the policies contained herein. In the case of alteration, ample advance notice will be provided.*

**COURSE TOPICS:** Resultants and equilibrium of force systems; stress and strain, truss and frame analysis, torsion, bending of beams, pressure vessels, stress concentrations.

| Section | instructor | office | phone | Email | mailbox | Office hours |
|---------|------------|--------|-------|-------|---------|--------------|
| 001     |            |        |       |       |         |              |

## TEXTBOOK:

*Statics and Mechanics of Materials - An Integrated Approach, Second Edition, W.F. Riley, L.D. Sturges and D.H. Morris, John Wiley & Sons, Inc., New York, 1995, ISBN 0-471-43446-9.*

## GRADING:

|                     |     |                        |            |
|---------------------|-----|------------------------|------------|
| Lab Assignments (2) | 2%  | Quizzes/Attendance     | 3%         |
| Design:             | 15% | Scheduled Quizzes (5)  | 5%         |
| -report = 6%        |     | <b>Exams 1 &amp; 2</b> | <b>40%</b> |
| -presentation = 5%  |     | -lower score = 15%     |            |
| -performance = 4%   |     | -higher score = 25%    |            |
| Homework            | 10% | <b>Final Exam</b>      | <b>25%</b> |

**Note:** Grading will be based on technical considerations (engineering analysis, appropriateness of assumptions, computational accuracy, etc.) and non-technical considerations (organization, neatness & professional approach, grammar, spelling, writing style, etc.).

## GRADING SCALE:

|   |           |   |
|---|-----------|---|
| A | 90 - 100% | (highest degree of excellence)                                |
| B | 80 - 89%  | (superior)  |
| C | 70 - 79%  | (average)   |
| D | 60 - 69%  | (quality of work that is minimum for receiving course credit) |
| F | < 60%     | (failure)   |

Note: A "D" may not be sufficient to continue in certain courses later in your curriculum.

**MINIMUM REQUIREMENTS:** Your job is to attend class and to complete the assigned work. Failure to reach all of the following minimum levels of performance will result in a grade of F in the course:

- ◆ a non-zero score on at least half of the quizzes and on the lab assignments;
- ◆ completion of the design project and presentation;
- ◆ an average of at least 60% on your three tests.

**Adjustments:** *The lower limit in each grade range may be lowered slightly such that the division between letter grades occur at any gaps in the grade spectrum. This adjustment will be determined only after the final averages are computed and may or may not alter the grade scale.*

## HOMEWORK:

- ◆ Approximately one homework assignment will be given per class period.
- ◆ Paper homework assignments are due at the beginning of the period on the indicated date.
- ◆ Discussion of homework problems among students is encouraged. However, any exchange of written information (including electronic transmissions) regarding the homework problems is considered cheating. In accordance with Louisiana Tech University policy, the consequences of cheating may include expulsion from the course with a grade of "F".
- ◆ For most homework assignments, the WebWork system will be used (webwork.latech.edu). Your login information should be the same as your LATech email.
- ◆ You are required to keep a 3 ring binder with your paper based solutions to the WebWork problems. These solutions should be neat and follow engineering format. You will turn in this binder on the 29<sup>th</sup> class period to count as 15% of your homework grade. See separate homework formatting guide for the required format of this binder.
- ◆ When asking the instructor for help, you will be required to show how you got started with the problem in proper engineering format (including a sketch, "Given, Find..." sections, and units).

### **ATTENDANCE QUIZZES :**

- ◆ Blackboard will be used to give a daily attendance quiz. You need to have access to a laptop in class for these quizzes. (Except on Exam or Scheduled Quiz dates.) Some of you may find that your mobile phone will work to take these quizzes.
- ◆ Attendance quizzes will be given in the first 10 minutes of class. Therefore tardiness may be counted as an absence.
- ◆ Except for the first class meeting, the text section associated with a class meeting (as indicated on the syllabus) should be read before class. Quizzes may be taken from the reading assignments.

### **LABORATORY PROJECTS :**

- ◆ Two laboratory projects will be assigned that involve the completion of special homework assignments. These assignments will be detailed in handouts. These assignments will be **INDIVIDUAL** projects. Data will be collected in class, but all reporting (entering data into program, generating graphics files, calculations, etc.) must be completed individually without assistance of others.
- ◆ There may be a number of other labs that will be done partially in class and partially out of class. For these, you will submit computations, data plots, and your analysis as a team **OR** individual homework assignment, as directed by the instructor.
- ◆ ANY exchange of work between students (except between team members in a team project) is considered cheating. In accordance with Louisiana Tech University policy, the penalty for cheating may include expulsion from the course with a grade of "F".
- ◆ Late projects will be penalized 10% per day, including Saturday and Sunday (2 days late means that the maximum possible score is 80%). Projects turned in on the due date **AFTER** the beginning of class will be considered one day late.

### **DESIGN PROJECT :**

- ◆ One design project will be assigned. The projects will be submitted as a formal technical report and as a 6 minute oral presentation. The required format for the report and guidelines for the oral report will be given when the design project is assigned. All team members **MUST** speak during the design presentation.
- ◆ The design project will be a team effort, and each team member may complete an evaluation of the other team members. The work must be performed entirely by the team, and all team members must participate. Any exchange of work between teams is considered cheating. In accordance with Louisiana Tech University policy, the penalty for cheating may include expulsion from the course with a grade of "F".
- ◆ Late design reports will be penalized 10% per day, including Saturday and Sunday (2 days late means that the maximum possible score is 80%). Projects turned in on the due date **AFTER** the beginning of class will be considered one day late. No report more than 5 days late will be accepted.

### **PEER EVALUATION:**

The laboratory and the design project may require that students complete peer evaluation forms for the members on their team. These evaluations will be confidential and will be used in computing an individual's score on the design or laboratory assignment in question.

### **ATTENDANCE :**

- ◆ Regular and punctual class attendance is required (refer to the 2009-10 catalog regarding attendance).
- ◆ An unexcused absence for an examination, quiz, or presentation will result in a zero grade.

There *may* be one makeup exam (only for those who have been excused from an exam). It will be a comprehensive exam held at the end of the quarter.

*Louisiana Tech has an Honor Code that all students are expected to know. The purpose of the code is to maintain the academic integrity of the university. It is important to you because it defines what appropriate behavior is and what the penalties for violations are. Please take time to read it and follow it.*

Check [blackboard.latech.edu](http://blackboard.latech.edu) for more class information.

| Class | Date | Reading                | Topic   |
|-------|------|------------------------|---|
| 1     |      | Ch 1, 2<br>and 3       | Overview of Syllabus<br>Equilibrium of Concurrent force Systems   |
| 2     |      |                        | Equilibrium of Concurrent Force Systems:<br>3D problems<br><i>Lab Orientation</i>   |
| 3     |      | 4.1 - 4.2<br>4.10      | Axial Loading<br>Normal, Shearing and Bearing Stress<br><i>QUIZ 1: Equilibrium of Concurrent Force Systems</i>                              |
| 4     |      | 4.4 - 4.5              | Displacement, Deformation and Strain<br>Stress and Strain Relationships<br>Design Loads, Working Stresses and Factor of Safety              |
| 5     |      | 4.7                    | Deformation of Axially Loaded Members<br><i>Design Project Rules Given/Purpose of Labs Discussed</i><br><i>LAB 1: Stress Until Fracture</i> |
| 6     |      | 5.1 - 5.2<br>6.1 - 6.3 | Moments, Equilibrium of Rigid Bodies, Free Body Diagrams<br><i>QUIZ 2: Stress, Strain, and Deformation</i>                                  |
| 7     |      | 6.6                    | Plane Trusses: Method of Joints   |
| 8     |      | 6.6                    | Plane Trusses: Method of Sections   |
| 9     |      |                        | <i>QUIZ 3: Trusses</i><br>Computer Solutions to Truss Problems  |
| 10    |      |                        | <b>Exam 1 (covers class 1 through 8)</b>  |
| 11    |      | 6.4                    | <i>Exam Review</i><br>Frames and Machines   |
| 12    |      | 6.4                    | Frames and Machines   |
| 13    |      | 5.7-5.8<br>5.9-5.10    | Center of Gravity and Center of Mass, Centroids<br>Centroids of Composite Bodies<br>Distributed Loads on Structural Members                 |
| 14    |      | 8.6                    | Beam Introduction, Frames and Machines,<br>Shear Forces and Bending Moments in Beams  |
| 15    |      | 8.7                    | Shear and Bending Moment Diagrams   |
| 16    |      | 8.1 - 8.3<br>8.5       | Flexural Normal Stresses (simple cross sections)<br><i>Materials distributed for buckling lab and beam contest</i>                          |
| 17    |      | 8.4 - 8.5              | Moments of Inertia (more complex cross sections)<br><i>Beam Design Contest (table groups)</i>   |
| 18    |      | 8.9<br>11.1 - 11.3     | Design of Beams<br><i>LAB 2: Buckling, Euler's Equations</i>  |
| 19    |      |                        | <i>Quiz 4: Beams</i><br><i>Flexural Member Review</i>   |

|    |  |           |  |
|----|--|-----------|--|
| 20 |  |           | <b>Exam 2 (covers class 11 through 19)</b>   |
| 21 |  | 7.1 - 7.3 | <i>Exam Review</i><br>Torsional Stresses   |
| 22 |  |           | <i>Truss Design Considerations</i><br><i>Design Team Formation</i><br><i>Buckling of Various Cross-Sections</i>  |
| 23 |  | 7.4       | Torsional Displacements<br><i>Strain Gauges and Wheatstone Bridges</i>   |
| 24 |  | 7.6 - 7.7 | Power Transmission<br><i>Voltage Measurement with the Boe-Bot</i>  |
| 25 |  | 10.13     | Thin Walled Pressure Vessels<br>Project Work<br><i>make sure you have access to solid modeling software with FEA</i>   |
| 26 |  | Notes     | Finite Element Methods<br>Stress Concentrations (Axial, Torsional, Flexural)   |
| 27 |  |           | TBA Day  |
| 28 |  | Notes     | <b>Presentation of Design Projects</b><br>(Upload your Power Point presentation to digital dropbox before 7:30 am this day. Also bring a laptop with your presentation on it to class, as well as a printout of the slides: in color if possible, 6 slides per page)<br><b>Testing of Trusses in Class</b> |
| 29 |  |           | Course Review, Assessment, and Wrap-up<br><i>Quiz 5: Torsion and Power Transmission</i><br>(Comprehensive Makeup Exam if needed for excused absences)  |
| 30 |  |           | <b>Exam 3 – comprehensive</b>  |