Spring 1-1-2020

MET 237-102: Strength of Materials for Technology

Ali Rohafza

New Jersey Institute of Technology
Department of Engineering Technology
MET 237 Strength of Materials for Technology

COURSE NUMBER	MET 237
COURSE NAME	Strength of Materials for Technology
COURSE STRUCTURE	2-2-3 (lecture hr/wk - lab hr/wk – course credits)
COURSE COORDINATOR/ INSTRUCTOR	Dr. A. Sengupta/ A. Rohafza
COURSE DESCRIPTION	Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structured problems, and an understanding of the mechanical behavior of materials under various load conditions. The laboratory experience is integrated within the course. Upon successful completion of this course, the students should be able to determine stresses and deformations for a variety of simple structural problems.
PREREQUISITE(S)	MET 235 or Mech 235
COREQUISITE(S)	None
REQUIRED, ELECTIVE OR SELECTED ELECTIVE	Required
REQUIRED MATERIALS	Beer, Johnston, DeWolf, and Mazurek Mechanics of Materials, Eigth Edition, McGraw-Hill, ISBN: 9781260113273 Lab Manual (NJIT BOOKSTORE/ONLINE)
COMPUTER USAGE	Microsoft Office
COURSE LEARNING OUTCOMES (CLO)	By the end of the course students should be able to: 1. Determine stresses and deformations for a variety of structural problems. 2. Develop shear and bending moment diagrams for a variety beams. 3. Develop Mohr's Circle for a various states of plain stress or strain. 4. Determine the deflection of beams for simple loadings. 5. Determine the Euler buckling load for simple columns. 6. Determine the stresses in pressure vessels. 7. Analyze data and prepare laboratory reports.
CLASS TOPICS	Stresses, Strains, Displacement, Deformation, Statically Indeterminate Problems, Strain Energy, Temperature Change, Torsion, Flexural Stresses, Shear and Moment Diagrams Shear Stresses, Plane Stress and Strain Transformations, Mohr's Circle, Strain Rosette, Failure Criteria, Hooke's Law, Deflection of Beams, Superposition, Columns. Pressure Vessels and Combined Loading
STUDENT OUTCOMES	The Course Learning Outcomes support the achievement of the following MET Student Outcomes and TAC of ABET Criterion 9 requirements:

Student Outcome b - an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
Related CLO – 1 thru 6

Student Outcome c - an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
Related CLO – 7

Student Outcome e - an ability to function effectively as a member or leader on a technical team;
Related CLO – 7

GRADING POLICY

NOTE: GRADING POLICY MAY BE MODIFIED BY INSTRUCTOR FOR EACH SECTION IN THE COURSE)

Homework	15 %
Quizzes (3 @ 15% ea.)	45 %
Final Exam	25 %
Laboratory	15 %

There are three quizzes during the semester. The lowest grade will be dropped. However, if you achieve an A for all three quizzes, you will not be excused from the final. There will be no makeup tests – if you miss one test, then that is the test you will drop.

Homework sets are due one week after they are assigned. Late penalty is minus one problem grade. Assignments more than one week late will not be accepted.

- Homework must be submitted in sets, arranged in order as in course outline.
- Homework must be written on quadrille 8½ x 11 engineering pad, one side only. Sets must be stapled together in the upper left hand corner.
- Homework problems should done using the "Given and Find" format and all equations should be defined symbolically prior to calculating any values. DO NOT HAND IN class notes or scratch work.

You need to be present and participate when the lab experiment is conducted in order to receive credit for the report. All labs reports are due in two weeks after they were conducted. After the due date reports will be accepted for 75% credit. After the reports have been returned to the class late reports will be accepted for only 50% credit. Assignments more than two weeks late will not be accepted. A lab passing grade is required to pass the course.

ACADEMIC INTEGRITY

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For

more information on the honor code, go to
http://www.njit.edu/academics/honorcode.php

STUDENT BEHAVIOR

- No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories.
- Cellular phones must be turned off during the class hours – if you are expecting an emergency call, leave it on vibrate.
- No headphones can be worn in class.
- Unless the professor allows the use during lecture, laptops should be closed during lecture.

MODIFICATION TO COURSE

The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline.

PREPARED BY
Ali Rohafza

COURSE COORDINATED BY
Dr. A. Sengupta

CLASS HOURS & LOCATION

Tuesday	5:45 PM – 9:50 PM	CKB 303

OFFICE HOURS

By appointment: ar234@njit.edu

LABORATORY SAFETY

Your safety and the safety of those around you are of prime importance. Efforts have been made to reduce the hazard in the lab as much as possible. If you should see anything that you consider to be a safety hazard report this condition to your lab instructor. Take your experiments seriously. Forces into the thousands of pounds will be used throughout the course and if these forces are released in an uncontrolled manner injuries are possible. Horseplay will not be tolerated and will constitute grounds for dismissal from the course.

All reports should written using MSWord. Laboratory data will be supplied in Excel spreadsheet format, and all graphs should be done using same. The results of the experiment are the results you must work with. Draw your conclusions based on these results. If they are not as expected (you should have an idea of the expected results), account for the discrepancies.

Reports are also graded on your presentation. Is the material presented in a logical way? Can all of the required results be found with ease? Are the results discussed intelligently, in a good technical language? Can all the questions that enter the readers mind be satisfied? Be advised that your discussion and conclusions will probably carry more weight than production of the right answers.

GRADING LEGEND

GRADE	NUMERIC RANGE
A	90 to 100
B+	85 to 89
B	80 to 84
C+	75 to 79
C	70 to 74
D	60 to 69
F	0 to 59

LECTURE SCHEDULE:

Week	Topics	Reading Assignment	Homework Assignment
1 1/21	Stresses and Strains	1.1 to 1.5	1, 4, 7, 64, 12, 29, 46, 5, 60
2 1/28	Strains, Displacement and Deformation, Hooke's Law, Statically Indeterminate Problems	2.1 to 2.8	4, 128, 19, 27
3 2/4	Statically Indeterminate Problems, Strain Energy, Temp. Change	2.1 to 2.8	130, 55, 50, 52, 60, 65
4 2/11	Torsion **Quiz #1**	3.1 to 3.4	3, 9, 21, 35, 38, 156, 51, 158
5 2/18	Flexural Stresses	4.1 to 4.5	1, 16, 12, 193,
6 2/25	Advanced Topics on Beams	4.1 to 4.5	24, 41, 49
7 3/3	Shear and Moment Diagrams	5.1 to 5.3	3, 6, 10, 19, 20, 21
8 3/10	Design of Prismatic Beams in Bending **Quiz #2**	5.1 to 5.3	156, 65, 71, 87
SPRING BREAK 3/15-3/22			
9 3/24	Shear Stresses	6.1 to 6.4	1, 3, 12, 18, 20, 40
10 3/31	Plane Stress Transformations, Mohr's Circle, General State of Stress, 3-D	7.1 to 7.5 7.7 to 7.9	5, 6, 15, 22, 31, 37
11 4/7	Failure Criteria, Plane Strain Transformations, Strain Rosette	7.1 to 7.5 7.7 to 7.9	5, 6, 15, 22, 31, 37
12 4/14	Columns **Quiz #3**	10.1	1, 9, 12, 11
13 4/21	Deflection of Beams, Superposition	9.1 to 9.2, 9.4	3, 1, 5, 16, 29, 100
14 4/28	Pressure Vessels and Combined Loading	7.6	99, 109, 108
TBD	**FINAL EXAM**		

LABORATORY SCHEDULE:

Room: Calton Hall Rm #422

Week	Lab Topic
2 (1/28**)**	Introduction, Safety Procedures for Lab, Lab Reports, Using Spreadsheets for the Labs, Grading Policies
3 (2/4**)**	**Experiment 1:** Tension Test of Metals, Automated Testing
5 (2/18)	**Experiment 2:** Torsion Test of Metallic Materials
7(3/3)	**Experiment 3:** Stresses, Strains and Deflection of Steel Beams in Pure Bending
11 (4/7)	**Experiment 4** : Strain Measurements Using Strain Rosettes in Aluminum Beams
13(4/21)	**Experiment 5:** Compression Test of Steel Columns