



جامعة حفر الباطن
University of Hafr Al Batin

College of Engineering, Civil Engineering Department

Second Semester (172)

Course code	Title	Credit hr
CE 211	Structural Mechanics I	3

Instructor: Dr. Moruf O. YUSUF

Office hours: Sunday: 9:00 AM – 11:00 AM
Monday: 10:00 AM – 11:00 AM and 1:00 PM – 2:00 PM
Tuesday: 9:00 – 10:00 AM
Wednesday: 1:00 PM – 2:00 PM
Thursday: 9:00 PM – 10:00 PM
Or by appointment

Or by appointment

Office: 2223; **Phone:** 1143

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Designation: Required

1. Course Description

This course will provide students an opportunity to master problem-solving skills. Concepts of stress, strain, and constitutive relations; stress and deformation of axially loaded members; thermal stresses; pressure vessels; energy concepts; torsion of circular and thin-walled sections; shear and bending moment diagrams in beams; elastic bending and shear stresses in beams; compound stresses; stress transformation; bending moment-curvature equation; deflection of beams; singularity functions methods, analysis and design applications.

2. Textbook

"*Mechanics of Materials*", by R.C. Hibbeler. 9th Edition.

3. Prerequisites and Co-requisite

Course Prerequisite: CE 201

4. Course Objectives

The overall learning objective of this course is to provide students with a deeper understanding of applied mechanics of materials. Specifically, the course will;

- i. Introduce the fundamental concepts of stress, strain, and constitutive relations; stress and deformation of axially loaded members; thermal stresses; pressure vessels.
- ii. Introduce the energy concepts; torsion of circular and thin-walled sections; shear and bending moment diagrams in beams; elastic bending and shear stresses in beams.
- iii. Introduce the concept of combined loadings; stress transformation; Mohr's Circle; deflection of beams by moment-curvature equation and discontinuity functions.
- iv. Introduce the method of super position, analysis of statically indeterminate beams, and design of beams and shafts.

5. Course Outcomes

After the successful completion of the course, the student should be able to meet the requirements of the following learning outcomes:

- i. Apply knowledge of mathematical tools, science and engineering to study stress, strain, and deformation of axially loaded members; thermal stresses; pressure vessels.
- ii. Identify, formulate and solve engineering problems utilizing the principles of energy concepts; torsion of circular, noncircular and thin-walled sections; shear and bending moment diagrams in beams; elastic bending and shear stresses in beams.
- iii. Have the analytical ability for the analysis of combined loadings; stress transformation; Mohr's Circle; deflection of beams by moment-curvature equation and discontinuity functions.
- iv. Have adequate analytical tools, skills and modern engineering tools necessary for courses on analysis of structural members and design applications.

6. Major Topics Covered in the Course

No.	Content	Chapter
1	Stress	1
2	Strain	2
3	Mechanical Properties of Materials	3
4	Axial Load	4
5	Torsion	5
6	Bending	6
7	Transvers Shear	7
8	Combined Loadings	8
9	Stress Transformation	9
10	Design of Beams and Shafts	11
11	Deflection of Beams and Shafts	12

7. Mapping between Course Outcomes and Student Outcomes

Student outcomes	a	b	c	d	e	f	g	h	i	j	k
Course outcomes											
1	✓										
2					✓						
3			✓								
4											✓

8. UOHB Rules and Regulations:

A. Attendance in the theory class:

- i) Attendance in the class, **note taking** and punctuality and arrival on time will be strictly observed.
- ii) Warnings I & II will be issued to the students before the issuance of DN grade.
- iii) DN grade is obtained upon recording 10 and 14 for unexcused and total (excused and unexcused) absences, respectively (see table below).

	Number of unexcused absences			Total absences (excused* & unexcused)
	Warning I	Warning II	DN	DN
Lecture of course with 45 lectures per semester	4	7	10	15

*Note: Officially authorized excuse of absences must be presented to the instructor no later than two days following his class resumption

- iv) Any student given the **DN grade** shall be responsible solely to clear himself with the registrar, should he is inclined to change it.
- v) Attendance in the classes will be taken within five minutes from the beginning of the class. *Student who does not arrive to class on time (within 5 minutes from the start of class) is marked as late. If the student is marked late 3 times, then this equivalent to 1 unexcused absence. Student who arrives more than 5 minutes late is considered absent with no excuse.*
- vi) **Students should bring the following into the class:** course textbook, notebook, calculator and pen to each class.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but not limited to the following practices:

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting of published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- Taking an exam for another student.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.

C. Class/Lab Rules - Smoking, eating, or drinking is not permitted at any time. Excuse must be sought before going out of the class for any reason.

D. Assignments and Quizzes:

Problems will be assigned on each chapter of the course. You will be required to solve these problems and submit the solution within one week.

i) No assignments will be accepted after its due date.

ii) Homework & quizzes will be given as at when necessary to satisfy the learning outcome. There will be no makeup quizzes or allowance for late submission of the homework (assignment). You should make every effort to meet all the announced deadlines for the assigned tasks while unavoidable excuse should be discussed with the instructor prior to the deadline.

9. Communication

All course related communication shall be through the “Blackboard”. You may also visit the instructor during his office hours or by sending e-mail.

SCHEDULE OF EXAMS FOR CE-211 (Structural Mechanics)

Examination	Major I	Major II	Final Exam.
Week No.	6 th	10 th	16
Date	27.02.2018	25.03.2018	14 th May 2018

Note:

- a. Make-ups exam will be given only in case of approved medical excused from the Supervisor, ACHB
- b. Report any potential conflicts with other exams well **in advance**.

10. Schedule of Work for CE 211, Structural Mechanics I

Week #	Lecture #	Lecture Topic	HW & Quizzes	Textbook Section #
1	1 21/01 Sun	INTRODUCTION		1.1
	2 23/01 Tue	Equilibrium of Deformable Bodies and stress		1.2, 1.3
	3 25/01 Thur	Average Normal Stresses		1.4
2	1 28/01 Sun	Average Shear Stresses		1.5
	2 30/01 Tue	Allowable Stress, Limit State Design		1.6, 1.7
	3 01/01 Thur	Deformation and Strain		2.1, and 2.2
3	7 04/02 sun	The Tension and Compression Test and Stress-Strain Diagram		3.1, 3.2
	8 06/02 Tue	Hook's Law, Material Behavior, Poisson's Ratio, and Shear Stress-Strain Diagram		3.3, 3.4, 3.5, 3.6 and 3.7
	9 08/02 Thu	Hook's Law, Material Behavior, Poisson's Ratio, and Shear Stress-Strain Diagram		3.3, 3.4, 3.5, 3.6 and 3.7
4	10 11/02 Sun	Saint-Venant's Principle, Elastic Deformation of an Axially Loaded Member, and Superposition principle		4.1, 4.2, 4.3
	11 13/02 Tue	Statically Indeterminate Axially Loaded Members		4.4
	12 15/02 Thur	The Force Method, Axially Loaded Members (Indeterminate)		4.5
5	13 18/02 Sun	Thermal Stresses		4.6
	14 20/02 Tue	Stress Concentration		4.7 Major 1
	15 22/02 Thu	Torsion of Circular Shaft, the Torsion Formula		5.1, 5.2
6	15 25/02	Torsion of Circular Shaft, the Torsion Formula		5.2

	Sun			
	16 27/02 Tue	Power Transmission		5.3
		EXAM: M1 (1.1 – 4.6) Tuesday, Feb. 27, 2018 @ 06:00 – 08:00 PM		
	17 01/03 Thu	Angle of Twist		5.4
7	18 04/03 Sun	Statically Indeterminate Torque-Loaded Members		5.5
	19 06/03 Tue	Torsion of Solid Non-Circular Sections		5.6
	20 08/03 Thu	Twisting of Thin-Walled Closed Sections		5.7
8	21 11/03 Sun	Stress Concentration		5.8
	22 13/03 Tue	Shear and Bending Moment Diagrams: Shear and Moment Functions		6.1
	23 15/03 Thu	Shear and Bending Moment Diagrams: Graphical Method		6.2
9	24 18/03 Sun	Bending Deformation of a Straight Member and Flexural Formula		6.3 & 6.4
	25 20/03 Tue	Bending Stresses in Straight Beams (Unsymmetrical Bending And Stress Concentrations)		6.5 & 6.9
	26 22/03 Thu	Shear in Straight Beams, Shear Formula		7.1, 7.2
10	27 25/03 Sun	Shear Flow in Built-Up Members		7.3
	28 27/03 Tue	Shear Flow in Thin-Walled Members		7.4
		EXAM: M2 (4.7 – 7.1) Sunday, March 25, 2018 @ 06:00 – 08:00 PM		
	29 29/03 Thu	Shear Center for Open Thin-Walled Members		7.5
11	30 01/04 Sun	Stresses in Thin-Walled Pressure Vessels		8.1
	31 03/04 Tue	State of Stress Caused by Combined Loadings		8.2

	32 05/04 Thu	State of Stress Caused by Combined Loadings		8.2
12	33 08/04 Sun	Transformation of Plane Stress		9.1
	34 10/04 Tue	General Equations of Plane-Stress Transformation		9.2
	35 12/04 Thu	Principal Stresses and Maximum In-Plane Shear Stress		9.3
13	36 15/04 Sun	Mohr's Circle – Plane Stress		9.4
	37 17/04 Tue	Mohr's Circle – Plane Stress		9.4
	38 19/04 Thu	Design of Beams		11.1, 11.2
14	39 22/04 Sun	Shaft Design		11.4
	40 24/04 Tue	The Elastic Curve & Slope and Displacement by Integration		12.1, 12.2
	41 26/04 Thu	Beam Deflection: Moment-Discontinuity Functions		12.3
15	42 29/04 Sun	Slope and Displacement by the Moment-Area Method		12.4
	43 01/05 Tue	Method of Superposition		12.5
	44 03/05 Thu	Statically Indeterminate Beams (Method of Integration)		12.6 & 12.7
16	Final Exam (comprehensive)			

11. Class/ Laboratory Schedule

3 lectures a week with 50 mins each.

12. Assessment Plan for the Course:

<i>Homework</i>	<i>10%</i>
<i>Class Quizzes</i>	<i>10%</i>
<i>Note taking/Class participation</i>	<i>5%</i>
<i>Major Exam #I</i>	<i>20%</i>
<i>Major Exam #II</i>	<i>20%</i>
<i>Final Exam (<u>Comprehensive</u>)</i>	<i>35%</i>

13. Estimated Distribution of Content

Engineering Science	80%	(2.4 credit hours)
Engineering Design	20%	(0.6 credit hours)

Prepared/Modified by: Dr. M.O. Yusuf **Date:** 19-012-2017