

**ENGR 310 – Mechanics of Materials  
Fall 2008**

**Instructor:** Joseph Hartmann, Adjunct and Affiliated Professor, CEIE Department  
**Office:**  
**Email/Phone:** [jhartma5@gmu.edu](mailto:jhartma5@gmu.edu) , [joey.hartmann@fhwa.dot.gov](mailto:joey.hartmann@fhwa.dot.gov) , (202)493-3059  
**Office Hours:** In classroom FAB B108, Monday, 3:30 p.m. – 4:30 p.m., and upon request.

**Teaching Assistant:** [Sailesh Tripathi](#)  
**Office:** ST2, Room 308  
**Email:** [stripat1@gmu.edu](mailto:stripat1@gmu.edu)  
**Office Hours:** Upon request.

**Course Objectives:** The ultimate objective of the course is to learn the mechanics of materials, including: basic concepts, fundamental computational models, applications of these models in structural analysis.

**Textbook:** “Mechanics of Materials”, 7<sup>th</sup> Edition, Hibbeler R.C., Pearson/Prentice Hall, 2008

**Rules:**

- a) Eight home assignments will be given, and they will be due as announced.
- b) Late home assignments may be given partial credit.
- c) Six unannounced quizzes will be conducted.
- d) Missed exams can be made up only when proof of a medical or of a personal emergency is provided (unless arrangements have been made prior to the exam).
- e) All complaints regarding grading of home assignments, quizzes, and exams must be reported to the instructor immediately after grades are returned.

**Final Exam:** Final exam will be comprehensive, on Dec. 15, 2008, 4:30 p.m.- 7:15 p.m.

**Grading:**

Home assignments	16%	
Quizzes	8%	(best 4 of 6 scores)
Two exams	44%	(2 x 22%)
Final exam	32%	

**TOPICS:**

**1. Stress and strain** *Chapter 1 (1.1 – 1.7), Chapter 2 (2.1, 2.2)*

Mechanics of materials, deformable body, conditions of equilibrium, stress, normal stress, shear stress, general state of stress, average normal stress, average shear stress, Saint-Venant’s principle, single and double shear, complementary stresses, allowable stress, factor of safety, design of simple connections, bearing/contact stress, deformation, strain, normal strain, shear strain, Cartesian strain components.

**2. Stress analysis** *Chapter 3 (3.1 – 3.4, 3.6), Chapter 4 (4.1 – 4.3, 4.6)*

Tension and compression test, stress-strain diagram, ductile versus brittle materials, Hooke’s law, Poisson’s ratio, elastic elongation, principle of superposition, thermal elongation.

**3. Stress transformation** *Chapter 9 (9.1 – 9.4, 9.7)*

Plane-stress transformation, general equations, principal stresses, maximum in-plane shear stress, Mohr’s circle, absolute maximum shear stress.

**4. Torsion** *Chapter 5 (5.1, 5.2, 5.4)*

Torque, circular shaft, torsional deformations, torsion formula, angle of twist, warping.

**5. Bending** *Chapter 6 (6.1, 6.3 – 6.5)*

Shear and moment diagrams, moment - shear force – transverse loading relationships, neutral surface, neutral axis, bending deformations, flexure formula, unsymmetric bending.

**6. Transverse shear** *Chapter 7 (7.1 – 7.5)*

Shear in straight members, shear formula, shear stresses in beams, shear flow, shear flow in built-up members.

7. **Deflections of beams** Chapter 12 (12.1, 12.2, 12.4, 12.5)

Elastic curve, curvature of neutral surface, slope and displacement by integration, boundary conditions, method of superposition.

8. **Buckling** Chapter 13 (13.1 – 13.3)

Column, stability, buckling, mathematical model, Euler's formula, critical load, effective length.

**LECTURES**

No.	TOPIC	DATE	COMMENTS
L1	Stress and strain	Aug 25, 2008	
L2	Stress and strain & Stress analysis	Sep 8, 2008	
L3	Stress analysis & Stress transformation	Sep 15, 2008	
L4	Stress transformation	Sep 22, 2008	
L5	Torsion	Sep 29, 2008	
L6	<b>1<sup>st</sup> Exam &amp; Bending</b>	Oct 6, 2008	1 <sup>st</sup> Exam: L1, L2, L3, L4
L7	Bending	Oct 14, 2008	<b>TUESDAY</b>
L8	Bending	Oct 20, 2008	
L9	Transverse shear	Oct 27, 2008	
L10	Transverse shear & <b>2<sup>nd</sup> Exam</b>	Nov 3, 2008	2 <sup>nd</sup> Exam: L5, L6, L7, L8
L11	Deflection of beams	Nov 10, 2008	
L12	Deflection of beams	Nov 17, 2008	
L13	Buckling	Nov 24, 2008	
L14	Course review	Dec 1, 2008	

**HOME ASSIGNMENTS**

No.	TOPIC	ISSUED	DEADLINE
HA1	Statics Review	August 25, 2008	September 8, 2008
HA2	Stress and strain	September 8, 2008	September 15, 2008
HA3	Mohr's circle	September 15, 2008	September 29, 2008
HA4	Torsion	September 29, 2008	October 14, 2008 (Tuesday)
HA5	Bending	October 14, 2008	October 27, 2008
HA6	Shear	October 27, 2008	November 10, 2008
HA7	Deflection & Buckling	November 10, 2008	November 17, 2008
HA8	Buckling	November 24, 2008	December 1, 2008

**RECITATIONS** (Monday 7:20 p.m. – 10 p.m., Thompson Hall 222)

No.	TOPIC	DATE
R1	Stress and strain	September 8, 2008
R2	Mohr's circle	September 22, 2008
R3	Torsion	October 6, 2008
R4	Bending	October 20, 2008
R5	Shear	November 3, 2008
R6	Deflection	November 17, 2008
R7	Buckling	December 8, 2008