WORCESTER POLYTECHNIC INSTITUTE
MECHANICAL ENGINEERING DEPARTMENT

STRESS ANALYSIS

COURSE No.:	ES–2502, D'2020	INSTRUCTOR:	*Cosme Furlong*
TEXT:	*Mechanics of Materials*, 10th ed.		Lab: HL–040
	R. C. Hibbeler, Pearson, 2016		Office: HL–152, x5126
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WEB PAGE:	http://users.wpi.edu/~cfurlong/es2502.html		
LECTURES:	M, Tu, Th, F @ 9:00 AM, Video Conferencing	TA's:	*Zachary Zolotarevsky*
CONF. MTGs:	W @ 9:00 AM, Video Conferencing		Email:
SUBJECT:	Course Outline		zjzolotarevsky@wpi.edu
DATE:	25 March 2020		

HOMEWORK

SAVE AND ORGANIZE **ALL** OF THE ASSIGNED HOMEWORK PROBLEMS AND SOLUTIONS IN ELECTRONIC FORMAT. Instructor & TA will ask you to submit *several* of those problems (randomly chosen) for grading. *In some cases, some homework problems will be part of the exams.*

Assigned problems will be posted on our webpage soon after most lectures, normally by no later than early afternoon. Theory developed and example problems done in lectures should normally provide guidance to complete assigned homework. *Occasionally, the assignments will cover materials that we have not yet covered in lecture.*

Homework will be collected twice during the week. The schedule of when homework is due and when it will be returned is as follows:

Everything assigned before, including	Day due	Day returned & answers posted
Monday	Wednesday	Friday
Tuesday/ Wednesday	Friday	Monday

Good faith collaboration on the homework assignments is encouraged. In good faith collaboration, students should first make serious attempts to solve the problems on their own, and only then discuss the problems with one another to clarify difficulties they may have had. If the collaboration is done properly then, even though students have worked together, the details of their solutions should still be quite different.

EXAMS

THERE WILL BE SEVEN (7) EXAMS. Exams will be given on Wednesdays during tele/ video conference times. Each exam will include all the materials covered until Monday (inclusive).

Note:

- Exams are solved individually during our tele/ video conference times.
- To ensure fairness in your evaluation, the lowest exam score will be dropped.

GRADING

THE GRADE FOR THE COURSE WILL BE BASED 50% ON THE EXAMS and 50% ON THE HOMEWORK. *Participation in course discussions, demonstrated engagement in the course material, demonstrated effort, and other positive contributions made to the course will strongly be taken into consideration for grading.*

NOTE: In all your work, state explicitly every assumption and/or approximation made, explain every procedure, and justify its use. Dimensional analyses are absolutely necessary. All results must be expressed in appropriate units. PLEASE, ALWAYS SHOW ALL WORK, while writing your results only on one side of the sheet(s) of paper; start each problem on a new sheet.

LIST OF TOPICS

Unit 1: Introduction
Unit 2: Stress: Find internal forces first
Unit 3: Stress: Definition of normal stress and shear stress
Unit 4: Stress: Designing a connector based on stress criteria

Unit 5: Strain: Definition of normal strain and shear strain

Unit 6: Stress-strain relationship – Hook's law

Unit 7: Tension/compression of slender longitudinal bars: General
Unit 8: Tension/compression of slender longitudinal bars/Advanced: Statically indeterminate
Unit 9: Tension/compression of slender longitudinal bars/Advanced: Thermal stress
Unit 10: Tension/compression of slender longitudinal bars/Advanced: Stress Concentrations
Unit 11: Tension/compression of slender longitudinal bars/Advanced: Nonlinear deformations

Unit 12: Torsion of Shafts: Circular cross section
Unit 13: Torsion of Shafts /Advanced: Statically indeterminate
Unit 14: Torsion of Shafts /Advanced: Non-circular cross-sections

Unit 15: Bending of beams: MV Diagrams
Unit 16: Bending of beams: MV General relationship
Unit 17: Bending of beams: Classical beam theory: Normal stress
Unit 18: Bending of beams/Advanced: Shear stress
Unit 19: Bending of beams: Calculation of section properties
Unit 20: Bending of beams/Advanced: Non-symmetrical bending
Unit 21: Bending of beams: Deflection analysis
Unit 21B: Bending of beams: Deflection analysis by discontinuity functions
Unit 22: Bending of beams: Statically indeterminate beams

Unit 23:	Buckling of columns

Unit 24: Stress transformation: Principal stresses and principal directions
Unit 25: Stress transformation by Mohr's circle

Unit 26:	Failure theory

Unit 27: Designing structural longitudinal member under combined loading

Unit 28:	Summary

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