Course Outcomes Guide (COG)

Course Title: EGR 203 Mechanics of Materials **Date:** May 1, 2019

Course Team: Ed Sigler

Expected Learning Outcomes

1. Determine the internal forces and moments produced in objects subjected to various forces.
2. Calculate the stress and strain in materials subjected to various loadings.
3. Calculate material properties (E, G, ν) and apply these properties to the solution of engineering problems and the derivation of basic equations for stress.
4. Calculate centroids and moments of inertia for plane areas
5. Solve problems relating to stresses in beams and shafts (bending, shear, torsion and axial)
6. Solve beam deflection problems
7. Analyze statically indeterminate shafts and beams
8. Solve stress transformation problems and principal stresses using Mohr's circle
9. Perform stress analysis under combined loading – 2D and 3D
10. Perform analysis of columns

Assessment

The assessment for the course common mid-term and final exams administered to all sections of EGR 203.

1. Students are required to compute internal forces and moments directly or as part of solution to problems on both exams.
2. Students are required to compute stress and strain directly or as part of solution to problems on both exams and also understand the stress/strain diagram for ductile materials.
3. Students are required to ν from given information and then solve for material deformations
4. Students are required to calculate the centroid and moment of inertia as part of solution to problems on both exams.
5. Students are required to compute torsional stress of a shaft under load, compute shear flow for built-up beams,
6. Students are required to find the maximum deflection in a beam under load using beam slope and deflection formulas and principal of superposition
7. Students solve statically indeterminate problem combining thermal stress and immovable wall.
8. Students compute maximum stress and shear stress from given Mohr's circle and complete stress transformation using stress transformation computations
9. Students compute axial and shear stress for hollow shaft under load, c-beam under load, I-beam analysis using structural property tables.
10. Students use the elastic curve for a beam to solve for statically indeterminate systems.
11. Students compute the critical load for a column pinned at both ends

Validation

Learning outcomes are assessed through homework problems, midterm exams, and the final exam. Common questions for each exam are given to each section of the course. Data collected from these exams will be used to identify areas of weakness and to adjust instruction accordingly.

Results

Data from 2013 through Spring 2019 has been analyzed. See Table below.

Major Findings

Fall 2016 and Fall 2017

Students have a difficulty with the shear stress and bending moment diagrams – which are necessary as part of determining principal stresses and also for beam design. Improvement in EGR 108 would assist here.

Also, plan to move more quickly through initial material and reduce coverage of tangential concepts in order to improve time in later chapters (elastic curve and column buckling).

Fall 2018

Students have a difficulty with the shear stress and bending moment diagrams – which are necessary as part of determining principal stresses and also for beam design. Shear and bending moment diagrams were emphasized in EGR 108 SP 2018. This contributed to better understanding of these concepts for FA 18 EGR 203. Principle Stress/Strain remain an important concept that remains difficult for students.

Continue to structure the course to more quickly through initial material and reduce coverage of tangential concepts in order to improve time in later chapters (elastic curve and column buckling).

Budget Justification

None

Course: EGR 203 SLOA Data **Faculty Team: E. Sigler**

	FA 2014	SP 2015	FA 2015	SP 2016	FA 2016	SP 2017	FA 2017	SP 2018	FA 2018	SP 2019
# Active students	14	6	12	N/A	17	N/A	14	N/A	11	N/A
%W	0	0	0		0		0		0	
*# walk-away Fs No final exam/grade = F	1	0	2		0		0		0	
% Success (A,B,C)	71.4%	100%	83.3%		88.2%		71.4%		63.6%	
Common Comprehensive Final Exam Score Average	74.4% N=12**	76.7% N=6	71.3% N=10		76.4% N=17		69.5% N=14		75.2% N=11	
Mean course grade	2.50	2.67	2.33		2.23		2.29		2.55	
Item Analysis **Weakest Content Areas**	Flexure, Torsion and Strain Rosettes	Elastic Curve, Mohr's Circle, Flexure and Torsion	Elastic Curve, Flexure, Stress Transform-ations		Shear and Moment diagrams, Elastic Curve		Shear and Moment diagrams, Elastic Curve, Combined Stress		Principle Stress/ Strain	

*% Walk-away Fs = Did not take the final exam and received a grade of F.

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