Course Outcomes Guide (COG)

Course Title: EGR 203 Mechanics of Materials **Date: May 22, 2015**

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 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 Spring 2012 through Spring 2015 has been analyzed. See Table below.

Major Findings - Spring 2015

Changing the course from the spring semester to the fall semester seemed to benefit some students.

Students have difficult with the application of flexure and torsion formulas to the determination of combined state of stress. Students also have difficulty with computation reactions using beam elastic curves and boundary conditions.

Follow-up

The application of flexure and torsion to determine the state of stress coupled with state of stress transformations will be emphasized through in-class worked problems and additional worked examples available on-line via Moodle.

Additional emphasis will be added to instruction via in-class examples of elastic curve superposition and boundary conditions for determination of reactions.

Budget Justification

None

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

	SP 2012	FA 2012	SP 2013	FA 2013	SP 2014	FA 2014	SP 2015	FA 2016	SP 2016	FA 2017	SP 2017
# Active students	4	N/A	7	12	N/A	14	6				
%W	0		0	0		0	0				
*# walk-away Fs No final exam/grade = F	1		0	3		1	0				
% Success (A,B,C)	75%		85.8%	66.7%		71.4%	100%				
Common Comprehensive Final Exam Score Average	81.0% N=3		71.3% N=7	72.9% N=9		74.4% N=12**	76.7% N=6				
Mean course grade			2.14	2.25		2.50	2.67%				
Item Analysis **Weakest Content Areas**	Statically Indeterminate Beams and shafts		Statically Indeterminate Beams and shafts	Statically Indeterminate Beams and shafts		Flexure, Torsion and Strain Rosettes	Elastic Curve, Mohr's Circle, Flexure and Torsion				

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

** - One incomplete