Course Outcomes Guide (COG)

Course Title: EGR 108 Statics **Update Date: 05/10/2019**

Course Team: Ed Sigler

Expected Learning Outcomes

1. Utilize vector components and vector mathematics (addition, subtraction, dot and cross product) to analyze forces and moments
2. Perform a thorough force analysis of rigid bodies and simple structures in equilibrium.
3. Draw clear and appropriate free-body diagrams.
4. Analyze trusses, beams, frames and machines.
5. Determine the centroids, centers of gravity and moments of inertia of simple geometric shapes and understand the physical applications of these properties.
6. Perform calculations related to friction forces in various engineering applications.
7. Determine internal forces and produce shear and moment diagrams for beams subjected to various loadings.

Assessment

Learning outcomes are assessed through homework problems, midterm exams, and a 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. A truss bridge design project was developed and introduced in FA 2104 to reinforce the design process and the equations of equilibrium.

Validation

Assessments are constructed to test student's knowledge and expertise against the expected learning outcomes. Validation occurs when reviews of assessments are compared to the learning outcomes.

MAT 203 (Calc 1) is a co-requisite for this course. Unfortunately, EGR 108 'hits' certain topics requiring familiarity with calculus concepts such as integrals prior to instruction of these concepts in MAT 203. For such students, the instructor must make time to provide additional assistance during class and more importantly outside of the classroom. Calculus is used in the derivation of centroids, moments of inertia and in the derivation of important formulas involving friction. Course assessments are constructed such that calculus is not needed in completion of the problems.

Results

Spring 2014:

Student assessments demonstrated that student learning objectives were met. However, based on detailed analysis, improvement can be made in four areas: trusses, distributed loads, friction and internal shear and moment diagrams.

Fall 2014/Spring 2015:

Student assessments for the Fall 2014 were sufficient regarding trusses, shear moment diagrams and block friction. Performance was not as good with frames and belt friction. Assessments in the Spring 2015 included improvement with belt friction but decrease in performance with shear moment diagrams. Spring 2015 added a suspended cable problem where most students did not recognize the type of loading and used incorrect analysis methods.

Additionally, a design project was added in Fall 2014 and continued into Spring 2015 which required student teams to select a truss design to hold at least 25 lbs with a span of 23 inches and be constructed of balsa wood and superglue. The project included calculation and analysis, bridge construction and demonstration with a report that documented all steps of the process. The project was very well received and will be continued.

Spring 2016:

Student assessments for the Spring 2016 were sufficient regarding trusses, distributed load and block friction. Performance was not as good with frames and belt friction. Assessment of shear and moment diagrams noted decreased performance versus previous years. Emphasis was placed on reminding students about 2-force members throughout the course after first introduction. This increased recognition on the final exam. Review sessions were held outside of classroom time and seemed to benefit students that attended. Similar to SP 16 for the suspended cable problem most students did not recognize the type of loading and used incorrect analysis methods.

Spring 2017:

Student assessments for Spring 2017 were sufficient for equilibrium, distributed loads, friction. Shear and moment diagrams continued to be problematic for students as these are somewhat difficult concepts to grasp. Review sessions were held outside of classroom time and seemed to benefit students that attended. Plan to reduce coverage at beginning of course for math review to increase time for shear/Moment diagrams and distributed loading on cables.

Spring 2018:

Spring 2019:

EGT 108 was run as a hybrid course for the first time this semester. Reading assignments, lecture notes with color-coded important points and concepts along with worked examples were provided. Lectures emphasized concept overview with worked examples further providing reinforcement of concepts. Student performance was on part with fully lecture courses. Student assessments for Spring 2019 were sufficient for most concept and compared favorably to previous years. Shear and moment diagrams continued to be problematic for students as these are somewhat difficult concepts to grasp. For shear moment diagrams, focused less on the algebraic method of computation and more on direct determination from free-body diagram and differential relationships. Seemed to help with student understanding.

Follow-up

Improvement will be implemented via the following:

1. Additional instruction and examples for internal shear and moment diagrams, potentially using computer analysis demonstrations.

2. Utilize engineering demonstration equipment to reinforce concepts. Incorporate use of demo equipment into semester design – moment demonstrations and inclined plane/friction.

Budget Justification No additional requirements at this time.

Course: EGR 108 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	12	12	N/A	24	N/A	14	N/A	16	N/A	13
# Withdrawn	0%	0%		1		0		0		2
*# walk-away Fs No final exam/grade = F	1	2		1		1		0		1
% Success (A,B,C)	66.7%	66.7%		82.6%		93%		87.5%		77%
Common Comprehensive Final Exam Score Average	71.7% N=11	63.4% N=9**		61.1% N=23		75.0% N=13		71.1% N=16		75.3% N=12
Mean course grade	2.00	2.17		2.48		2.79		2.44		2.69
Item Analysis **Weakest Content Areas**	1) Frames 2) Friction 3) Centroids	1) Frames 2) Friction 3) Shear/ Moment Diagrams 4) Cable loading		1) Frames 2) Shear/ Moment Diagrams 3) Cable loading		1) Shear/ Moment Diagrams		1) Shear/ Moment Diagrams		1) Frames 2) Shear/ Moment Diagrams

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

** - One student took final exam but did so poorly that it was not counted in overall statistics