Course Outcomes Guide (COG)

Course Title: EGR 204 Dynamics **Date:** May 10 2019

Course Team: Ed Sigler

Expected Learning Outcomes

1. Derive and apply the relationships between position, velocity, and acceleration of a particle in rectilinear and curvilinear motion.
2. Derive relations defining the velocity and acceleration of any particle on a rigid body for translation, rotation and general plane motion.
3. Correctly apply Newton's second law to analyze the motion of a particle in rectilinear or curvilinear translation acted upon by forces, or a rigid body in plane motion acted upon by forces and moments.
4. Apply the method of work and energy to problems involving a single particle, a system of particles, or a rigid body in plane motion.
5. Select the method of analysis that is best suited for the solution of a given problem. (Newton's Law, Work and Energy, Impulse and Momentum, or a combination of these methods.)
6. Describe and analyze the plane motion of a particle relative to a rotating frame.
7. Determine Coriolis acceleration in plane motion.
8. Apply the principle of impulse and momentum to problems of direct and oblique central impact, as well as eccentric impact.

Assessment

The assessment for the course common mid-term and final exams administered to all sections of EGR 204. The problem types and complexity are maintained as constant as possible across semesters to track per class variations.

1. Students are required to compute position, velocity and acceleration of a particle in rectilinear and curvilinear motion.
2. Students are required to compute position, velocity and acceleration of any point on a rigid body in translation, rotation, general plane motion and in rotating reference frames, including Coriolis acceleration.
3. Students are required to apply Newton’s second law to solve the motion of particles acted upon by forces and rigid bodies in plane motion acted upon by forces and moments.
4. Students are required to apply work/energy methods to solve for particle and rigid body motion or force/moments under planar motion.
5. Students must select the appropriate method for solution from the methods instructed.
9. Students are required to apply the principle of impulse and momentum to solve direct, oblique central impact and eccentric impact problems.

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. Exams include problems that are dedicated

to specific learning outcomes, or more often, combinations of these concepts for an individual problem. Problems are usually involved, so the combination of the three class exams serves to cover partially the complete outcomes assessment. Where possible, individual problems are crafted to cover as much as practical without undue complexity.

Results

Data from Fall 2014 through Spring 2019 have been included. The delta between final exam scores between years is not significant due to 1) small sample size and 2) difference in exam questions.

Major Findings

Spring 2015: Additional instruction is needed for application of the conservation of momentum to applied problems. Further, applications of Newton's 2nd Law with acceleration need to be stressed. These findings will be addressed though additional instruction, in-class worked examples and additional worked examples via Moodle.

Spring 2016: Students did very well on the exams and final.

Spring 2017: Rework of current examples and additional examples provided clarity of concepts to the students. Moving reference frames and combination of collisions with rotation was an issue for students. Plan to continue to provide additional examples on these concepts. Feedback from students was very positive regarding learning of the material in the course.

Spring 2018: The SP 18 EG 204 course was very small ~ 6 students. Course lectures and materials delivered similar to previous courses. Review sessions held prior to all three exams. Availability of textbook homework solutions is affecting the learning of students – Dynamics homework is hard and sometimes solutions require multiple attempts with differing methodologies. Will add instructor developed problems to HW assignment with larger weighting to force students to determine solutions themselves.

Spring 2019: Student performance on exam 2 was particularly strong in that students demonstrated they understood fundamental concepts but lacked ability to complete problems in some instances. Grades would be better if more students completed their homework assignment as HW is 15% (1 & ½ letter grades!).

Budget Justification

No additional budget is required for this class.

Course: EGR 204 **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	N/A	12	N/A	3	N/A	15	N/A	6	N/A	8
%W		0		0		0		0		1
*# walk-away Fs No final exam/grade = F		0		0		0		0[$]		1
% Success (A,B,C)		75%		100%		86.7%		60%		66.7%
Common Comprehensive Final Exam Score Average		71%		85%**		76%		69.6%		75.1%
Mean course grade		2.67		3.67**		2.73		1.6[&]		2.22
Item Analysis **Weakest Content Areas**		Cons of Momentum, 2nd Law				Moving Reference Frames		1 – Solution methodology 2 – Collisions 3 – Relative Velocity and Moving Ref Frames		1 – Solution methodology 2 – Relative Velocity 3) Consv of Angular Momentum

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

** - Sp 2016 was class of 3 very students that were academically strong – results are skewed from typical class performance.

[$] - One Incomplete due to medical issue.

[&] - Class size was very small. Student performance would be better if students submitted homework for grading and feedback.