ENG EK 301 Engineering Mechanics I

2008 - 2009 Catalog Data:
ENG EK 301 Engineering Mechanics I Prereq: CAS PY 211 and ENG EK 127; coreq: CAS MA 225. Fundamental statics of particles, rigid bodies, and trusses; dynamics of particles: Newton's laws of motion; energy and momentum methods. Application of vector analysis and introduction to engineering design. Includes design project. (MET EK 311 and EK 312 fulfill this requirement; however, only 4 credits can be applied towards the graduation requirement.) 4 cr, either sem.

Class/Lab Schedule: 4 lecture hours per week; two 2-hour project labs per semester

Status in the Curriculum: Required

Textbook(s) and/or Other Required Material:
Bedford and Fowler, Engineering Mechanics: Statics and Dynamics, 5th Edition, Pearson Prentice Hall, 2008.

Coordinator: Sean Andersson, Assistant Professor of Mechanical Engineering

Prerequisites by Topic:
1. Multivariate calculus.
2. A first year calculus based college physics course which includes mechanics.

Goals:
This first course in engineering mechanics is required of all engineering majors. The Goals are to develop in our students a mastery, at the elementary level, of both concept and detail, both theory and application. Engineering design will be introduced through a hands-on design contest intended to convince the students, through their own experience, of the value of engineering science and computer programming to engineering design. A professional approach to engineering will be stressed.

Course Learning Outcomes:
As an outcome of completing this course, students will:

i. Become proficient in the modeling and analysis of simple mechanical systems – both static (2-D and 3-D particle and rigid body equilibrium, 2-D trusses, dry friction) and dynamic (single particle curvilinear motion and two particle impact) – including the use of appropriate diagrams (physical, free body, kinetic, and impulse) and the choice of appropriate analysis methods (static equilibrium, Newton's Second Law, energy and momentum methods, and combinations of methods for multi-stage problems). (A,E)

ii. Gain experience in carrying out a complex, long term design project (2-D truss), including experimental measurement and statistical analysis of material properties, computer analysis of member forces to determine failure load, consideration of alternative designs to achieve an optimal outcome under cost and physical constraints, construction of a prototype, and testing of the prototype to confirm the theoretical prediction. (B, C, D, E, F, G, H, J, K, L,N)

iii. Gain experience in working in a team environment in the design project. (D)

iv. Gain an appreciation for the importance of safety factors and engineering ethics through selected homework problems and the consideration of the effects of over and under prediction of actual truss performance in the design project. (F)

v. Gain an appreciation of and a facility for producing well-organized and clearly written work to facilitate communications with others and review by supervisors. (G)

vi. Gain exposure to the greater engineering community through receiving announcements in class of Career Development Office and student professional society activities and through presentations in class on relevant contemporary issues and faculty research. (J)

Course Learning Outcomes mapped to Program Outcomes:
(For Program Outcomes, please see attached page or Department Web Site)

Program:	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Course:	i	ii	ii	ii, iii	i,, ii	ii, iv	ii, v	ii	ii, vi	ii, vi	ii	ii	-	ii
Emphasis:	5	2	3	2	5	3	3	2	2	2	3	3	1	3

Topics (time spent in weeks):
1. Statics of particles. (2)
2. Rigid bodies: Equivalent systems of forces. (2)
3. Equilibrium of rigid bodies. (1)
4. Trusses. (1)
5. Friction. (1)
6. Kinematics of particles. (2)
7. Kinetics of particles: Newton's second law. (1)
8. Kinetics of particles: Energy and momentum methods. (3)
9. In-class tests. (1)

Contribution of Course to Meeting the Requirements of Criterion 5:
Engineering Topics: 100%

Status of Continuous Improvement Review of this Course:
Date: April 16, 2009 **Reviewed by**: Structures-Dynamics Committee
Prepared by: Sean Andersson **Date**: January 14, 2009