MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 328 Design for Strength and Stiffness (4 Units) Required

Course Description: (2019-20 Catalog)	Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of shafts and other machine parts. Modern industrial design practice using standard components and design layout drawings. 3 lectures, 1 laboratory.
Prerequisite Courses:	BMED 212 or ME 234; CE 207; CPE/CSC 101 or CSC 231 or CSC 234; MATE 210; ME 212; and ME 251. Concurrent: IME 141 or ITP 341 or ME 161.
Prerequisites by Topic:	Design process and creativity Mechanics of materials Computer programming Materials science Engineering mechanics - dynamics Solid modeling Net shape manufacturing (concurrent permitted)
Textbook:	Shigley's Mechanical Engineering Design, 11th ed., R.G. Budnyas and J.K. Nisbett, McGraw-Hill, 2019.
References:	Mechanics of Materials, Beer, Johnston Roark's Formulas for Stress and Strain, Young, Budynas, Sadegh Manufacturer's catalogs
Course Coordinator/Instructor:	Peter Schuster, Professor of ME
Course Learning Outcomes:	1. Select appropriate materials for structural components. 2. Apply appropriate failure criteria for multi-dimensional stress states. 3. Design mechanical components based on material strength and stiffness constraints. 4. Describe the strengths and limitations of various stress and deflection prediction techniques. 5. Estimate appropriate design factors and stress concentrations. 6. Design mechanical components for cyclic (fatigue) loading conditions. 7. Formulate detailed engineering reports documenting the design of mechanical components. 8. Analyze structural components using elementary linear finite element analysis.

Relationship of Course to Mechanical Engineering Student Outcomes:	SO 1: Developing (D) SO 2: Developing (D) SO 3: Developing (D) SO 4: SO 5: Developing (D) SO 6: SO 7: Developing (D)
Topics Covered:	Design Process (problem definition, creativity, iteration, manufacturing considerations, structural analysis) Stress Analysis (axial, shear, torsion, bending, combined loading, contact, pressure vessels, stress concentrations, FEA) Strain and Deflection Analysis (beams, curved members, column buckling) Materials & Failure Criteria (selection, properties, design factors, design for strength and stiffness) Fatigue Analysis (infinite & finite cycles, design for fatigue)
Laboratory Projects:	Team-based lab projects applying the topics above to design practice.
Class/Lab Schedule:	Three 50-minute lectures per week. One 170-minute lab per week.
Contribution of Course to Meeting the Professional Component:	(a) College-level math and basic sciences: 0 credits (b) Engineering Topics: 4 credits Design: Yes (c) General Education: 0 credits (d) Other: 0 credits
Prepared by: Peter Schuster	**Date:** 11/17/19