ME450 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME450	**COURSE TITLE:** Design and Manufacturing III
REQUIRED COURSE OR ELECTIVE COURSE: Required	**TERMS OFFERED:** Fall, Winter
TEXTBOOK / REQUIRED MATERIAL: N/A	**PRE / CO-REQUISITES:** MECHENG 350, MECHENG 360, and MECHENG 395. May not be taken concurrently with MECHENG 455 or MECHENG 495. Not open to graduate students. I, II (4 credits)
COGNIZANT FACULTY: S. Skerlos	**COURSE TOPICS:** 1. Generation of project specifications and solutions in a team environment. Systematic design procedures include: Definition of project requirements; Research of design problem background and state-of-the art; Development of project proposal with defined targets and scope of work; Development of quantitative design specifications from qualitative problem statement; Generation and selection of creative design concepts using formal and informal methodologies; Development of simple mathematical models for final design concept; Utilization of rough prototyping methods; Consideration of safety, ethical, and environmental issues; Understanding when to select off-the-shelf components versus when to fabricate custom components; Understanding the relationship between design and manufacturing, including the selection of appropriate manufacturing processes 2. Use of physical and/or virtual prototypes of sufficient detail to serve the purpose of proof-of-concept and recommendations for design improvement 3. Presentation and reporting of final project outcomes and recommendations
BULLETIN DESCRIPTION: A mechanical engineering design project by which the student is exposed to the design process from concept through analysis to prototype validation and report. Projects are proposed from the different areas of study within mechanical engineering and reflect the expertise of instructing faculty. Two three hour sections of mixed lecture and laboratory activity per week. Course website: umich.edu/~me450	
COURSE STRUCTURE/SCHEDULE: 2 days per week at 3 hours (distribution of lecture / laboratory time varies by week)	

COURSE OBJECTIVES: **For each course objective, links to the Program Outcomes are identified in brackets.**	1. Solve an open ended mechanical engineering design problem including considerations of performance, cost, and societal considerations. The problem must provide opportunities for creative mechanical design, fundamental analysis, and proof of concept prototyping. Each student team works on a different project and everyone participates in project proposal development, reporting, and final design presentations [1, 2, 3, 4, 5, 6, 7] 2. Apply a design process appropriate to the engineering problem at hand, including unstructured creativity as part of a structured design problem [1, 4, 6] 3. Generate and evaluate design concepts after gaining a sound understanding of the problem background and existing design concepts [1, 2, 3, 6] 4. Identify a set of design variables and governing equations for the selected design concept that can be utilized to improve the design. [1, 2, 4, 6, 7]
COURSE OUTCOMES: **For each course outcome, links to the Course Objectives are identified in brackets.**	1. Given a qualitative and open-ended, "real-world", engineering design problem, suggest a solution based on technical analysis [1, 4] 2. Learn to work effectively in engineering teams to resolve conflict and meet quantitative engineering objectives established during the project. Learn to communicate effectively with peers, project sponsors, advisors, and/or mentors [1] 3. Learn to consider unstructured creativity as a natural part of a structured design process and to systematically generate concepts using methods such as brainstorming and decomposition [2] 4. Learn to make appropriate assumptions and exercise engineering judgment in solving an open-ended problem [1, 4] 5. Manage and plan large design projects using time management tools, and be able to handle uncertain and incomplete information effectively to meet project goals [1, 4] 6. Learn to clearly request and exchange quantitative information, and to communicate project results, to audiences of varying expertise levels [1] 7. Learn patent and literature search methods, benchmarking, and other general forms of background independent learning [1] 8. Integrate past course material to advance basic system concepts to a prototyping level, providing support for all design decisions by defensible engineering analysis and reasoning [1, 2, 3, 4]
ASSESSMENT TOOLS: **For each assessment tool, links to the course outcomes are identified**	1. Regular written and/or oral design reviews [1, 2, 3, 4, 5, 6, 7, 8] 2. Project exposition [1, 4, 6, 8] 3. Peer review [2]

PREPARED BY: E. Kannatey-Asibu, A. Hortop, ASO Staff
LAST UPDATED: 5/25/2021