ME250 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

<table>
<tr><td>COURSE NUMBER: ME250</td><td>COURSE TITLE: Design and Manufacturing I</td></tr>
<tr><td>REQUIRED COURSE OR ELECTIVE COURSE: Required</td><td>TERMS OFFERED: Fall, Winter</td></tr>
<tr><td>TEXTBOOK / REQUIRED MATERIAL: Coursepack</td><td>PRE / CO-REQUISITES: Math 116, ENGR 101 or equivalent. I, II (4 credits)</td></tr>
<tr><td>COGNIZANT FACULTY: Saitou, Umbriac, Austin-Breneman</td><td rowspan="2">COURSE TOPICS:

1. Engineering drawing
2. Computer Aided Design (CAD)
3. Dimensions and tolerances, including GD&T and statistical tolerances
4. Engineering design process, including identifying functional requirements and specifications, conceptual design, embodiment design, engineering analysis, prototyping, and testing.
5. Machine elements, including bearings, gears, springs, and DC electric motors
6. Engineering materials
7. Manufacturing processes
8. Rapid prototyping including 3D printing
9. Basic machine shop techniques, including safety
10. Writing technical reports and making technical presentations
11. Introduction to teamwork</td></tr>
<tr><td>BULLETIN DESCRIPTION: Basics of mechanical design: design process, system design, engineering drawing, and machine elements (e.g., bearings, gears, and springs). Basics of manufacturing: processes and materials. Exposure to CAD systems and basic prototyping and machine shop techniques. Design/ prototyping project. Three hours lecture and two hours laboratory.</td></tr>
<tr><td colspan="2">COURSE STRUCTURE/SCHEDULE: Lecture: 2 days per week at 1.5 hours., Laboratory: 2 days per week at 1.0 hour</td></tr>
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COURSE OBJECTIVES: for each course objective, links to the Program Outcomes are identified in brackets.	1. Introduce students to the mechanical engineering design process and how to develop a product from its conception to the construction of a prototype [1, 2, 4, 5] 2. Develop the technical skills necessary to generate an engineering drawing and an engineering assembly using a CAD system [1, 2, 3] 3. Provide a 'hands on' experience through shop training and the construction of a physical artifact [1, 2, 4, 6] 4. Introduce the elements of engineering communications, including graphical representation of artifacts, communication within the design team, written reports, and oral presentations [2, 3] 5. Introduce simple analysis and estimation of uncertainty in engineering design and manufacturing [1, 2, 6]. 6. Obtain a basic understanding of various engineering materials and the manufacturing techniques used to process these materials into useful products [1, 2] 7. Develop a basic understanding of various types of machine elements including bearings, gears, springs, and DC electric motors, and be able to apply these elements appropriately in the design and fabrication of a machine [1, 2]
COURSE OUTCOMES: for each course outcome, links to the Course Objectives are identified in brackets.	1. Students are able to understand engineering drawings with different views, including orthographic views, hidden lines and cross sectional views, and the representations of tolerances and surface finish on engineering drawings [1, 2, 4] 2. Students can create 3D models of engineering objects, engineering drawings with different views, and an assembly of the objects that make up engineered systems, using a CAD system [2] 3. Students are able to use basic machine shop equipment and hand tools in a safe manner [3] 4. Students develop an awareness of CAM and rapid prototyping, and the capabilities of these processes [3] 5. Students are able to design a moving machine based upon stated requirements and constraints, using a systematic design process [1, 4]. 6. Students are able to recognize and apply appropriately various types of bearings, gears, springs, couplings, and DC electric motors in the design and fabrication of a moving machine [7] 7. Students are able to use the cumulative distribution of the normal distribution to predict probabilities in the context of dimensional tolerances. [5] 8. Students are able to identify the main classes of engineering materials, namely metals, polymers, ceramics, and composites, and distinguish their main physical and mechanical properties. They also are able to name examples of artifacts made from these materials [3, 6] 9. Students are able to name the most common processing techniques for metals, such as machining, casting, forging, extrusion, stamping, and forming. They are able to describe each process and give an example of an artifact made by the process [1,3,6] 10. Students are able to name the most common processing techniques for polymers, such as injection molding, blow molding, thermoforming, and rotational molding. They are able to describe each process and give an example of an artifact made by the process. [1, 3, 6]
ASSESSMENT TOOLS: for each assessment tool, links to the course outcomes are identified	1. Regular homework problems [1,2,4,6,7,8,9,10] 2. Regular lab/machine shop assignments [2,3,5] 3. Team design project involving a design review and fabrication of a prototype[2,3,5,6] 4. Exams [1,2,4,6,7,8,9,10] 5. Peer and self-evaluations [5]

PREPARED BY: K. Saitou, M. Umbriac, ASO Staff

LAST UPDATED: 05/25/2021