ME 452 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

<table>
<tr><td>COURSE NUMBER: ME 452</td><td>COURSE TITLE: Design for Manufacturability</td></tr>
<tr><td>REQUIRED COURSE OR ELECTIVE COURSE: Elective</td><td>TERMS OFFERED: Winter</td></tr>
<tr><td>TEXTBOOK / REQUIRED MATERIAL:</td><td>PRE / CO-REQUISITES: MECHENG 350. I (3 credits)</td></tr>
<tr><td>COGNIZANT FACULTY: K. Saitou</td><td rowspan="2">COURSE TOPICS:

1. Customer requirements, product design specifications.
2. Conceptual design, design principles.
3. Major classes of manufacturing and assembly processes.
4. Product platforms and modular design.
5. Manufacturing tolerances and tolerance selection.
6. Material and process selection.
7. Design for assembly processes.
8. Design for manufacturing processes.
9. Taguchi method for robust design.
10. Rapid prototyping and design for additive manufacturing.</td></tr>
<tr><td>BULLETIN DESCRIPTION: Process, tools, and methods for enhancing the ease of manufacturing and assembly for product design. Conceptual design for economical manufacturing and assembly. Material and process selection. Product platforms and modular design. Design for manufacturing and assembly. Taguchi methods for robust design. Rapid prototyping and design for additive manufacturing. Design projects.</td></tr>
<tr><td colspan="2">COURSE STRUCTURE/SCHEDULE: Lecture: 2 days per week at 1.5 hours</td></tr>
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COURSE OBJECTIVES: **for each course objective, links to the Program Outcomes are identified in brackets.**	1. To teach students various steps in the product development process and the significance of early phases of design for economical production [1, 2, 3, 8, 11] 2. To teach fundamental principles of design for economical proudction and application of these principles in practical design problems [3, 5, 10, 11] 3. To teach design of products for ease of assembly and manufacture [3] 4. To teach interrelations among part geometry, tolerances, materials and manufacturing processes [3] 5. To teach principles of robust design procedures and how to set values for various design variables so that the product meets the performance requirements and remains insensitive to variations in manufacturing and use [3, 10, 11]
COURSE OUTCOMES: **for each course outcome, links to the Course Objectives are identified in brackets.**	1. Given a set of functional requirements and constraints, generate alternate concepts and objectively evaluate the concepts for their functionality and ease of production [1, 2, 3] 2. Map customer requirements to engineering characteristics, part characteristics, process parameters and production requirements taking into account of economical production [1, 2] 3. Application of fundamental principles of design to improve the ease of production while satisfying the performance requirements [3, 4, 5] 4. Given a product design, evaluate and improve the ease of manufacturing and assembly [3] 5. Establish a list of candidate materials for each component of design through the identification of functional requirements [1, 4] 6. Identify manufacturing processes based on part geometry and tolerances (ISO tolerances) [4] 7. Identify control factors, noise factors, and an appropriate orthogonal array to set up an experiment to establish relation between various design variables and performance requirements [2,5] 8. Apply all of the design methods learned in this course to redesign a product for ease of manufacture, assembly, and robustness (insensitive to variations) [5]
ASSESSMENT TOOLS: **for each assessment tool, links to the course outcomes are identified**	1. Regular homework assignments 2. Exam(s) and/or project(s)

PREPARED BY: K. Saitou
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