ME350 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME350	**COURSE TITLE:** Design and Manufacturing II
REQUIRED COURSE OR ELECTIVE COURSE: Required	**TERMS OFFERED:** Fall, Winter
TEXTBOOK / REQUIRED MATERIAL: ME 350 Textbook (custom textbook from McGraw Hill)	**PRE / CO-REQUISITES:** MECHENG 211, MECHENG 240, and MECHENG 250; (C- or better). I, II (4 credits)
COGNIZANT FACULTY: J. Stein, M. Umbriac	**COURSE TOPICS:** 1. Review of the design process and relevant design principles 2. Application of basic materials and mechanics to mechanical design 3. Analysis and synthesis with focus on selection methods for basic off-the-shelf mechanical components which may incude gears, bearings, springs, power screws, fasteners 4. Basic kinematic and kinetostatic analysis/synthesis of mechanisms such as four bar linkages 5. Selection and application of motors based upon predictive models and motor curves 6. Design of mechatronic systems for given motion/power requirements 7. Analysis of load and power flow through transmission systems including those with linkages 8. Preparation of engineering drawings and manufacturing plans, selecting the appropriate materials and manufacturing processes based upon geometry, loading and tolerances 9. Design, build and assemble mechanical systems using standard machine shop tools (manual mill, lathe, drill, waterjet cutter, and laser cutter) 10. Test and evaluate simple mechanical and mechatronic systems and components for performance and failure behavior using physical and virtual prototypes
BULLETIN DESCRIPTION: Principles of machine and mechatronic design and manufacturing. Analysis, synthesis and selection of mechanisms, machine components, mechatronic components, and associated manufacturing processes. Semester-long, model-based design/build/test project in a team setting. Two one-and-a-half hour lectures and one two-hour laboratory, per week	
COURSE STRUCTURE/SCHEDULE: Lecture: 2 days per week at 1.5 hours; Lab: 1 day per week at 2.0 hours	

COURSE OBJECTIVES: **for each course objective, links to the Program Outcomes are identified in brackets.**	1. To teach students how to formulate the design and manufacturing problem for mechanical and mechatronic systems [1, 2] 2. To teach students how to apply the general mechanical engineering sciences in analyses specific to the design of mechanical components and mechatronic systems [1, 2, 3, 4] 3. To teach students in a laboratory setting how to generate concepts, conduct analyses to size components, construct, assemble, and program a prototype of a system and test its function to meet the specifications of a design and manufacturing problem [1, 2, 4, 6] 4. To reinforce students' team skills through a team project, including problem formulation, problem solutions and written reporting of results [1, 2, 4, 3, 5, 6] 5. To reinforce students' visualization and hands-on skills through project virtual prototyping and/or physical construction exercises [1, 2, 6]
COURSE OUTCOMES: **for each course outcome, links to the Course Objectives are identified in brackets.**	1. Given functional and manufacturing requirements, utilize concept generation methods within a team setting to achieve a consensus for a product concept [1, 3, 4, 5] 2. Weigh tradeoffs in concept and detail design from the perspectives of function, manufacture, design effort and available resources [1, 3] 3. Apply basics of conservation and constitutive laws from the mechanical engineering sciences and mechatronics to understand the basic nature of a posed problem [2, 3] 4. Compile reference (e.g. catalog, handbook and textbook) resources to formulate an analysis for specific mechanical and mechatronic components addressed within those resources [1, 2, 3] 5. Conduct failure analyses, including stiffness, static strength and fatigue strength, appropriate for sizing common components, such as belt drives, rolling contact bearings, and gears. Conduct analyses to set the parameters for mechatronic components. [1, 2, 3, 5] 6. Make decisions regarding buy or build for individual components of a design [3, 4] 7. Use basic machines and hand tools to manufacture simple parts from metal and/or plastic to reasonable tolerances, and assemble them into a functional machine [3, 5] 8. Test, in a team setting or independently, the system performance andall failure modes that may be present per the analyses conducted during the design stage [3, 4, 5] 9. Translate, in a team setting or independently, test results into redesigns that will eliminate catastrophic failures and/or improve on marginal performance [3, 4, 5] 10. Communicate engineering decisions, justification for those decisions, designs, manufacturing plans, and test results in writing [4]
ASSESSMENT TOOLS: **for each assessment tool, links to the course outcomes are identified**	1. Regular homework problems [3, 4, 5] 2. One semester-long design project with manufactured prototype [1, 2, 6, 7, 8, 9] 3. Two design reports and one final report about the project [1, 2, 5, 6, 10] 4. Test of prototype's performance, and assessment of quality of design and manufacture [7, 8, 9] 5. Two written exams [3, 4, 5]

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