ME 455 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME 455	**COURSE TITLE:** Analyt Product Des
REQUIRED COURSE OR ELECTIVE COURSE: Elective	**TERMS OFFERED:** Fall
TEXTBOOK / REQUIRED MATERIAL: Course Pack	**PRE / CO-REQUISITES:** ME 350, ME 360 for ME majors. Non-ME majors: consent of Instructor (3-4 credits)
COGNIZANT FACULTY: D. Brei	**COURSE TOPICS:**
BULLETIN DESCRIPTION: Design of artifacts is addressed from a multidisciplinary perspective that includes engineering, art, psychology, marketing, and economics. Using a decision-making framework, emphasis is placed on quantitative methods. Building mathematical models and accounting for interdisciplinary interactions. Students work in team design projects from concept generation to prototyping and design verification. Four credit-hour election requires prototyping of project.	1. The decision-making paradigm in design Analytical decision making Decision theory and optimization Mathematical models, solution algorithms and software. 2. Functional analysis of design architectures. 3. The user's viewpoint of design Modeling tools in mathematical psychology and marketing Multidimensional scaling Clustering Conjoint analysis. 4. The producer's viewpoint of design Microeconomic models. Net present value. Cost-benefit analysis. Price-demand link: Nash Equilibrium. 5. The designer's viewpoint of design . Balancing user and producer desires. Engineering design in the enterprise context. A general model for enterprise design decisions. 6. Product design in complex organizations. Distributed design CAE and the Internet. Hierarchical design. Product families portfolio design. 7. Design and society. Designing in a regulatory environment. Ethical issues, Legal issues,: Patents and Liability. User and producer behavior modification through design regulation.
COURSE STRUCTURE/SCHEDULE:	

COURSE OBJECTIVES: for each course objective, links to the Program Outcomes are identified in brackets.	1. Learn and apply analysis methods from engineering and other disciplines, such as economics, statistics, and psychology, to address an open ended design problem from diverse multi-disciplinary perspectives. [1, 2, 3, 4, 5, 6, 7] 2. Work as a team on a real product design problem, accounting for engineering functionality, user appeal, and producer economics. [1, 2, 5, 6] 3. Develop mathematical decision-making models with identified design variables, objectives and constraints that include engineering, economic cost and profit, market demand, and aesthetics. Exercise the model to obtain optimized designs. [1, 3, 4, 6] 4. Develop a physical and/or virtual prototype of the designed artifact. [1, 2, 4, 6]
COURSE OUTCOMES: for each course outcome, links to the Course Objectives are identified in brackets.	1. Develop real solutions to open ended real product design problems. [1,3,4] 2. Manage work in teams, as a member and as a team leader. Understand and practice time and project management. [2] 3. Frame incomplete design problem statements and place them in the context of the market and society, including patent search, market analysis, ethical analysis and social impact analysis. Learn to deal with uncertainty in developing reliable products. [1.2.3] 4. Acquire skills and tools to describe a design situation through appropriate analysis models from a variety of disciplines. [2,3] 5. Understand and interpret the needs of the customer, and learn to communicate with peers, instructors, vendors, and customers. Specifically also learn to conduct scientific marketing surveys using statistical tools. [2,3] 6. Practice how to develop product technical and cost specifications, procure off-the-self components, fabricate custom components, interact with technicians. Recognize virtual prototyping alternatives for products or components that are expensive or difficult to build physically. Learn how to inform final design decision making through virtual and/or physical prototyping. [1,3,4] 7. Learn to develop an actual business plan for a new product (for internal or external stakeholders) using technical, economic, and marketing analytic arguments. [1,2,3,4] 8. Learn how to articulate work succinctly through timed presentations and demonstrations, including web-based.
ASSESSMENT TOOLS: for each assessment tool, links to the course outcomes are identified	1. Project work structured in individual assignments. [1- 8] 2. Comprehensive reports at regular intervals. [1,3,4,5,7] 3. In-class assignments [2,3,4,6,8] 4. Machine shop and computer simulation activities [6,8]

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LAST UPDATED: 5/25/2021