

TO: The Engineering Faculty

FROM: The Faculty of the School of Mechanical Engineering

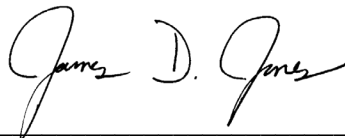
RE: New Course – ME 35401 Machine Design Laboratory

The Faculty of the School of Mechanical Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ME 35401 Machine Design Laboratory, Sem. 1, 2, SS, Lab 1, cr. 1. Prerequisites: ME 26300, ME 27400, and ME 32300 or equivalents. Concurrent Prerequisites: ME 36000

Physical experiments on static and fatigue failure of mechanical parts. Application of failure theories to design of mechanical components and systems. Open-ended design projects to reinforce the design process.

Reason: This course is the lab component of a newly proposed ME 35400 Machine Design course in our ME UG Program. The faculty have decided to remove the current ME 35200 Machine Design I (which covers different topics) and make this the new course ME 35400 Machine Design (which is a re-numbered and re-constituted ME 45200) and a corresponding lab, ME 35401 Machine Design Laboratory part of the core ME curriculum in its place of the 4 cr ME 35200 class. The faculty believe that the topics covered in these new courses are more central to the needs of mechanical engineering graduates. Details of this new laboratory are outlined in the appended material below.



James D. Jones, Associate Professor and Associate Head
School of Mechanical Engineering

ME 35401
MACHINE DESIGN LABORATORY

Course Outcomes [Related ME Program Outcomes in brackets]

1. Experiments on static and fatigue failure. [6]
2. Comparison of theory with physical experiments and simulation. [1]
3. Application of failure theories to design of machines. [2]
4. Open ended design projects. [2,3,7]

Static & Fatigue Failure

1. Ductile and Brittle failure
2. Experimental evaluation of Marin factors using RR Moore machine
3. Mechanical properties of notched and un-notched specimen; experiments to analyze the effects of stress concentration.
4. Static and fatigue failure of mechanical components manufactured through different processes (including advanced processes such as additive manufacturing).

Machine Components

1. Component selection
2. Standards

**Mechanical
Systems (Machines)**

1. Machine disassembly
2. Design of machines
3. Modeling real mechanical systems
4. Prototyping

Sample Labs and Design Projects

- Lawnmower engine disassembly
- Using the R.R. Moore machine to investigate the influence of surface roughness, size, geometry (i.e., the considerations included in Marin factors).
- Effects of stress concentration on fatigue failure of ductile and brittle materials
- Fatigue failure of additively manufactured parts
- Investigating 3D manufacturing of parts. Predicting failure (static and/or fatigue) with hand calculations, and/or simulation and comparing these results to experiments
- Design and development of in classroom demonstration test rigs

COURSE NUMBER: ME 35401		COURSE TITLE: Machine Design Laboratory (1 credit)	
REQUIRED COURSE OR ELECTIVE COURSE: Required		TERMS OFFERED: Fall and Spring	
TEXTBOOK/REQUIRED MATERIAL: None. Handouts provided by the instructors.		PRE-REQUISITES: ME 263 Introduction to Mechanical Engineering Design, Innovation, and Entrepreneurship ME 274 Basic Mechanics II ME 323 Mechanics of Materials	
COORDINATING FACULTY: TBD		CONCURRENT PRE-REQUISITES: ME 35400 Machine Design	
COURSE DESCRIPTION: Physical experiments on static and fatigue failure of mechanical parts. Application of failure theories to design of mechanical components and systems. Open-ended design projects to reinforce the design process.		COURSE OUTCOMES [Related ME Program Outcomes in brackets]: <ol style="list-style-type: none"> 1. Experiments on static and fatigue failure. [6] 2. Comparison of theory with physical and virtual experiments. [1] 3. Application of failure theories to design of machines. [2] 4. Open ended design projects. [2, 3, 7] 	
ASSESSMENTS TOOLS: <ul style="list-style-type: none"> • Laboratory reports. • Project reports. 		RELATED ME PROGRAM OUTCOMES: <ol style="list-style-type: none"> 1. Engineering fundamentals 2. Engineering design 3. Communication skills 4. Ethical/Prof. responsibilities 5. Teamwork skills 6. Experimental skills 7. Knowledge acquisition 	
NATURE OF DESIGN CONTENT: The students are required to design mechanical components and systems.			
PROFESSIONAL COMPONENT: <ol style="list-style-type: none"> 1. Engineering Topics: Engineering Science – 40% Engineering Design – 60% 			
COMPUTER USAGE: The design projects require students to write computer programs to conduct analysis studies.			
COURSE STRUCTURE/SCHEDULE: Laboratory - 1 day per week at 150 minutes.			
PREPARED BY: Jitesh Panchal and Farshid Sadeghi		REVISION DATE: December 18, 2019	