ME 3300 - COMPUTER-AIDED DESGIN, Winter 2018

Engineering Center 466, MW 7:30 pm - 9:17 pm

INSTRUCTOR

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OFFICE HOURS

Before and after each class, or by appointment.

COURSE DESCRIPTION – CATALOG DATA

(3) Use of engineering software in design and analysis such as: solid modeling of machine parts, projection views layout, parametric and knowledge-based design, assembly design, sheet and metal design, build of materials, structure design, introduction of finite element method, engineering optimization, space analysis and clash detection, mechanism and kinematics of assemblies. Offered fall and winter.

Prerequisite and Corequisite(s): Mechanics of Materials, ME 361 or ME 3250 and major standing.

PROGRAM OUTCOMES

a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environ., social, political, ethical, health, safety, manufactured ability, sustainability
d) An ability to function on multi-disciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

COURSE OBJECTIVES

To acquaint students with the state-of-the-art computer-aided design (CAD) technology in mechanical engineering design problems such as stress analysis, dynamic structural response, heat conduction, etc. By the end of the course, the successful student will be able to:

- Demonstrate proficiency in the principles of engineering graphics (b, g);
- Demonstrate proficiency in creating planar sketches using CATIA's Sketcher workbench (a, b, e, g, k);
- Design 3D parametric solid models using CATIA's Part Design, Wireframe & Surface Design, and Knowledge Advisor workbenches (a, b, c, e, g, k);
- Design and animate mechanical systems consisting of a number of components using CATIA's Assembly Design and DMU Kinematics workbenches (a, b, c, e, g, k);
- Formulate and solve finite element equations for 2D frames consisting of two-node bar and beam elements (a, b, e, k);
- Determine strength and deformation of machine components and mechanical systems subject to certain boundary and loading conditions using a commercial CAE package (a, b, c, e, g, k);

SOFTWARE & TEXT

Software: CATIA V5-6R2016 from Dassault Systems will be used for the course. Student version of CATIA is also available at http://academy.3ds.com for an annual lease fee. Make sure you get a

compatible version **(V5-6R2016)**. It would be student responsibility to make sure that all the submitted CATIA models should be able to be opened with CATIA installed on the OU computer lab.

Note: You will be using your own UserID for accessing the computers in the lab. Follow the instruction in the website below to request an SECS computer account.
https://elara.secs.oakland.edu/SECSNetworkLogins/request.aspx
The account would enable you to access most of SECS computers, and save your work files in a network drive. Any issue related to the access should be communicated with SECS help desk.

Texts:
Introduction to CATIA V6 Release 2012 (A Hands-On Tutorial Approach), Kirstie Plantenberg, ISBN: 978-1-58503-663-9, SDC Publications (www.sdcpublications.com).

CATIA V5 FEA Tutorials, Release 21, Nader Zamani, ISBN: 978-1-58503-764-3, SDC Publications (www.sdcpublications.com).

CATIA V5 Tutorials Mechanism Design & Animation Release 21, Jonathan M. Weaver and Nader Zamani**,** ISBN: ISBN: 978-1-58503-762-9, SDC Publications (www.sdcpublications.com).

CAD MODEL SUBMISSION

Moodle, the web application from Oakland University, will be used for class communication including, but not limited to, homework posting and submission, class notes, announcement, grades, etc. To submit your electrical files in Moodle, it is suggested to use the following naming convention to name files / folders: it should start with ME3300 followed by first initial and last name, then other names, e.g. hw01a, ex01, etc. File name example: ME3300_JDoe_ex01a.CATPart. **Please put all your files for submission into one zip file (7-Zip) with your first initial and last name and title of submission as the zip file name.**

HOMEWORK

Each homework assignment needs to be completed using the CATIA program installed on the PC's in 466 Engineering Center (EC). The assignment usually includes two parts: CATIA models and hard copies of the assignment. **You should submit hard copies of assignment sheets for grading and feedback remarks.** Please make backup copies of your files. Due date of the assignment will be announced when the homework is given. Please note that there are a limited number of workstations available with CATIA installed, and the lab is also shared by other classes. You are urged to start the homework as soon as possible. A 10% per day penalty will be placed on each late homework.

See Conduct Code below.

EXAMS

There will be tentatively three examinations during the semester. The exams are hands-on computer operations in which you are asked to complete models / drawings using CATIA. All the computer exams are open-book, open-notes tests. All exams are cumulative which require previous learned knowledge. The exams usually take 100 minutes.

PROJECT

A project will be assigned in about the tenth week of the semester. Each team of 2 persons will be asked to design and analyze an industrial product using CATIA. The object created will be judged based on its functionality, aesthetics, and engineering analysis. Further detail will be given in the project. **No late project will be accepted.**

Each team will be given 10-15 minutes to present their project in the class at the end of the semester.

GRADING

The final course grade will be the weighted average of the following components.

	Weight
Homework	20%
Project	20%
Exams	60%

From the past records, a 2.0 grade is equivalent to 55% ~ 65% of total points possible.

COURSE CONTENTS

The tentative course contents with the following topics:

- *Mechanical Design: Assembly Design*
  - *Design mechanical systems*
- *Digital Mockup: DMU Kinematics*
  - *Design and animate mechanical systems*
- *Analysis & Simulation: Advanced Meshing Tools, Generative Structural Analysis*
  - *Formulate and solve finite element equations: Fundamental of Finite Element Analysis*
  - *Analyze machine components and mechanical systems*
  - *FEA Mesh*
  - *Statics Analysis*
  - *Vibration / Modal Analysis*
- *Mechanical Design: Part Design*
  - *Planar sketches*
  - *Design 3D Parametric solid models*
  - *Engineering graphics*
- *Knowledgeware: Knowledge Advisor*
  - *Design parametric models*
- *Mechanical Design: Wire Frame and Surface Design, Generative Shape Design*
  - *Planar sketches*
  - *Parametric models*
- *Mechanical Design: Drafting*
  - *Principles of engineering graphics*
- *Mechanical Design: Generative Sheet Metal Design*
  - *Planar sketches*
  - *3D parametric solid models*
  - *Engineering graphics*

CONDUCT CODE

Discussions between persons and teams are encouraged, although homework assignments must be the individual work of a person. Persons suspicious of cheating or plagiarism will be brought to the attention of the Academic Conduct Committee (ACC) for investigation. If found guilty, they will be given a 0.0 final course grade in addition to the possible sanction imposed by ACC. You are urged to review the Academic Conduct Policy contained in your University Catalog or Schedule of Classes.

DATES OF NO LECTURE

ME3300 is a three-credit course. The following dates are not scheduled for class:
01/29/2018, 03/05/2018, 03/26/2018, 04/11/2018

TENTATIVE EXAM DATES

02/07/2018 (Assembly Design and DMU Kinematics)
03/14/2018 (Generative Structural Analysis and Advanced Meshing Tools)
04/23/2018 (Part Design, Knowledge Advisor, Drafting, Generative Shape Design, Generative Sheetmetal Design)