

**MIDDLE EAST TECHNICAL UNIVERSITY NORTHERN CYPRUS CAMPUS**

**Syllabus for MECH-533 Computer Aided Design  
2023-2024 Academic Year 2<sup>nd</sup> Semester**

METU Credit: 3(3-0)

ECTS Credit: 8.0

Prerequisite Course: MECH 307 Mechanical Engineering Design

**Instructor:**

Assoc. Prof. Dr. Murat SÖNMEZ

Office: R-217

Office Phone No: 2934

E-mail Address: [sonmez@metu.edu.tr](mailto:sonmez@metu.edu.tr)

**Course Schedule:**

Assoc. Prof. Dr. Murat SÖNMEZ 2023-2024 Academic Year Spring Semester							
SCHEDULE							
Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
08:40 - 09:30				MECH 100 (S1) [I-104]			
09:40 - 10:30				MECH 100 (S1) [I-104]	MECH 533 (S1) [I-104]		
10:40 - 11:30	MECH 113 (S1) [I-104]	MECH 114 (S1) [I-104]		MECH 205 (S1) [I-104]	MECH 533 (S1) [I-104]		
11:40 - 12:30	MECH 113 (S1) [I-104]	MECH 114 (S1) [I-104]		MECH 205 (S1) [I-104]	MECH 533 (S1) [I-104]		
12:40 - 13:30							
13:40 - 14:30							
14:40 - 15:30							
15:40 - 16:30				MFAK - SÖNMEZ []			
16:40 - 17:30	MECH 205 (S1) [I-104]			MFAK - SÖNMEZ []			
17:40 - 18:30		ASE 492 (S1) [I-104]	MECH 114 (S1) [I-104]	MECH 113 (S1) [I-104]	ASE 492 (S1) [I-104]		
18:40 - 19:30		ASE 492 (S1) [I-104]	MECH 114 (S1) [I-104]	MECH 113 (S1) [I-104]	ASE 492 (S1) [I-104]		
19:40 - 20:30							

**Course Objectives:**

At the end of the course, the students will be able to

- Learn the fundamentals of Computer- Aided Design
- Perform stress- strain analysis using the classical stress analysis tool of Inventor
- Perform stress- strain analysis using Inventor NASTRAN
- Perform stress- strain analysis using the tools of Autodesk- Fusion
- Perform thermal stress analysis in Fusion and Inventor Nastran environments
- Find sustainable shape for a body
- Design common machine elements in Inventor environment
- Design structures using the tools of Inventor
- Design permanent and removable fasteners in Inventor environment
- Perform modal analysis and determine resonance frequencies of objects

**Course Content:**

Review on engineering design process, Review on stress, strain, fatigue, failure theories, CAD Software, Review on solid model creation, Stress Analysis tools of Inventor, Autodesk Inventor Nastran, Eco Materials Advisor tool of Inventor-sustainable design, Static stress analysis, Thermal analysis, Thermal stress analysis in Fusion 360 environment, Shaft design in Inventor, Welded joint design in Inventor, Removable fastener design in Inventor, Pulley-belt mechanism design in Inventor, Gear design in Inventor, Introduction to CAM.

**Reference Books and other Supplementary Materials:**

- \* “Engineering Design” by George E. Dieter and Linda C. Schmidt., 4<sup>th</sup> Ed., 2009, McGraw-Hill
- \*\* “Machine Design- Theory and Practice” by Aaron D. Deutschman and at.al., 1975, Macmillan Publishing Co. Inc
- \* “Tools for Design Using AutoCAD 2018 and Autodesk Inventor 2018” by Randy Shih, SDC Publications.
- \* “Computer- Aided Design- Software and Analytical Tools” by C.S. Krishnamoorthy and at.al., 2005, Alpha Science International Ltd.
- \* “Fundamentals of Computer Aided Engineering”, by B. Raphael and I.F.C. Smith, 2003, John Wiley & SonsLtd.
- \*Lecture Notes in METU Class

**CAD Software:** Autodesk Inventor- v 2024  
Autodesk Fusion- 360

**Grading:**

Mid-Term Exam : 40%  
Quizzes& Pop Quizzes', Class Works, Home Work : 30%  
Final : 30%

Important Note for Attendance: 70% attendance is mandatory. If your attendance is below 70%, you will not be allowed to take the midterm and the final exams.  
(Attendance is optional for the ones who repeat the course for increasing the grade from BB if they accept that PQ grade will be substituted by the previous PQ grade)

Week	Topic
1	Design, Computer-Aided Design
2	Review on solid model creation in Inventor, Solid Model Creation in Fusion-360
3	Review on the strength of materials- Stress, Strain, Failure theory
4	Stress-Strain Analysis tools of Inventor
5	Introduction to Nastran. Stress analysis using the tools of Nastran
6	Stress-Strain Analysis in Fusion environment
7	Shaft design using the tools of Inventor
8	Weldments- Engineering calculations for sizing weld joints
9	Calculation tools of Inventor for sizing the welded joints
10	Calculation tools of Inventor for removable joint design
11	Sustainable design. Environmental impact of manufacturing
12	Sustainable design tools of Inventor, Shape Generator of Inventor
13	Gear design- Tools of Inventor
14	Design tools of Inventor for pulley- Belt mechanisms Introduction to CAM, Tools of FUSION

**Relationship to Performance Indicators**

This course contributes to fulfillment of the following performance indicators:

- a1. Identify and apply necessary assumptions and principles of science to fundamental engineering problems
- c2. Devise conceptual design alternatives and select the appropriate option
- c3. Convert conceptual design into a form ready to be produced
- c4. Construct a functional prototype based on design documentation
- e3. Solve and verify the mathematical model using appropriate tools, such as software and simulation
- k1. Use tools for 3D CAD modeling and fabrication/manufacturing

**Important Note: It is recommended to have a personal computer for studying CAD applications at home. The properties of an eligible computer can be seen from the document which can be accessed from the web address:**

<http://users.metu.edu.tr/sonmez/MECH%20113/MECH%20113home.htm>

**NOTE: Without taking the permission of the instructor, course materials; lecture notes, video records, work-sheets, exam questions, and their solutions are not allowed to share**

