

Syllabus

ASE 492 Special Studies

Computer Aided Engineering Design and Drawing (2-2) 3

(Technical Elective Course)

2025-2026 Academic Year Spring Semester

Course ECTS Credit

6

Catalog Description

Stress analysis tools of Inventor, Autodesk Inventor NASTRAN, static stress analysis, thermal analysis, Thermal stress analysis in Fusion 360 environment, Details on Sectional Views, Geometric Tolerance, Surface Texture, Assembly Modelling in Inventor Environment, Weldments and Welding Annotations, Common Machine Elements; CAD applications in Inventor, Design Tools of Inventor, Conventional Views of Machine Elements, Sheet Metal Components and Developments.

Prerequisite(s)

MECH 113, ASE 264 (or MECH 206)

Offered Semester: Spring Semester (Regular)

Assoc. Prof. Dr. Murat Sönmez, 2025-26 Academic Year Spring Semester

| SCHEDULE | | | | | | | |
|---------------|--------------------------|--------------------------|-----------|--------------------------|--------------------------|----------|--------|
| Time | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| 08:40 - 09:30 | | ASE 492 (S1) [I-104] | | MECH 113 (S2) [I-104] | MECH 303 (S1) [I-104] | | |
| 09:40 - 10:30 | | ASE 492 (S1) [I-104] | | MECH 113 (S2) [I-104] | | | |
| 10:40 - 11:30 | | MECH 114 (S1) [I-104] | | | | | |
| 11:40 - 12:30 | | MECH 114 (S1) [I-104] | | | | | |
| 12:40 - 13:30 | | | | | | | |
| 13:40 - 14:30 | MECH 303 (S1) [I-104] | | | | | | |
| 14:40 - 15:30 | MECH 303 (S1) [I-104] | | | | | | |
| 15:40 - 16:30 | | | | MFAK - SÖNMEZ [] | MECH 114 (S1) [I-104] | | |
| 16:40 - 17:30 | | | | MFAK - SÖNMEZ [] | MECH 114 (S1) [I-104] | | |
| 17:40 - 18:30 | MECH 113 (S1) [I-104] | MECH 113 (S2) [I-104] | | MECH 113 (S1) [I-104] | ASE 492 (S1) [I-104] | | |
| 18:40 - 19:30 | MECH 113 (S1) [I-104] | MECH 113 (S2) [I-104] | | MECH 113 (S1) [I-104] | ASE 492 (S1) [I-104] | | |
| 19:40 - 20:30 | | | | | | | |

Reference books, Other Supplementary Materials

| TEXT BOOK TITLE | | AUTHOR | YEAR | ISBN |
|-----------------------------|---|-----------------------------|------|-------------------|
| Lecture Notes in METU CLASS | | | | |
| REFERENCE MATERIAL TITLE | | AUTHOR | YEAR | ISBN |
| 1 | Technical Drawing with Engineering Graphics, 15 th Ed. | F. Giesecke, and at.al. | 2017 | 13:9780137400140 |
| 2 | Tools for Design Using AutoCAD 2018 and Autodesk Inventor 2018 | Randy Shih | 2018 | 978-1-63057-127-6 |
| 3 | Computer Aided Design: Software and Analytical Tools | C.S. Krishnamoorthy, at.al. | 2005 | 978-1842651261 |

Course Learning Outcomes

a. *specific outcomes of instruction*

Having successfully completed the course, the student will have achieved the following:

- (1) Perform stress analysis using the tools of Inventor, NASTRAN, and FUSION
- (2) Distinguish which parts/features the special hatching rule is applied in creating sectional views, create removed, aligned sections, and use the tools of Autodesk Inventor to shoot some troubles in creating sectional views
- (3) Show geometric tolerances on engineering drawings (in CAD application, particularly using tools of Autodesk Inventor) and explain, interpret geometric tolerances shown on an engineering drawing
- (4) Describe surface texture, use tools of Autodesk Inventor, and explain the meaning of surface texture symbols
- (5) Draw/ create and read the detailed drawings (working drawings) of objects.
- (6) Create the solid model of assemblies, mating the solid models of custom-built parts and of the standard objects, particularly in Autodesk Inventor environment, create and read Assembly Drawings, create animation files.
- (7) Create the solid model of structures using standard structural elements in Autodesk Inventor
- (8) Create solid models and engineering drawings of weldments, and perform design calculations using the tools of Autodesk Inventor
- (9) Can perform the fatigue analysis and determine the technical life of components using the design tools of Autodesk Inventor
- (10) Can determine the natural frequencies (resonance frequencies) for components and assemblies using the tools of Inventor and FUSION
- (11) Can find the optimum shape for a component using the "Shape Generator" tool of Inventor and FUSION
- (12) Can perform the buckling analysis and determine the critical load using Inventor NASTRAN, and also FUSION
- (13) Create the solid models, and perform design calculations of standard threaded objects; bolts, nuts, cap screws, and studs (particularly in Autodesk Inventor environment) and create and read the schematic views of them, explain the meaning of their specification notes.
- (14) Can determine the temperature distribution within a component, considering heat transfer, and can determine the thermal stress.
- (15) Create solid models of sheet-metal works, create developments (particularly in the Autodesk Inventor environment)

Teaching Format

4 METU Hours Lecture & CAD Applications, 10 hours video watching per week.

Computer Usage

The course is a computer-aided course. Autodesk Inventor, and FUSION are used for creating solid models, their views, and performing design calculations.

Category Content

| | |
|--------------------------------|-----|
| Mathematics and Basic Sciences | 10% |
| Engineering Sciences | 15% |
| Humanities and Social Sciences | 5 % |
| Departmental | 10% |
| Engineering Design | 60% |

Grade Points:

| | |
|------------------------------------|--------|
| Midterm Exam | : 40 % |
| Pop Quizzes, Quizzes & Class-works | : 30 % |
| Final | : 30 % |

Attendance Requirement: 80% attendance is mandatory. If the attendance of student is below 80% the student will not be allowed to take the midterm and the final exams.

Relationship to Performance Indicators

This course contributes to the fulfillment of the following performance indicators:

1c: **Use of Engineering Tools:** Utilize modern engineering tools (e.g., software, simulations, data analysis tools) to solve and validate models and interpret results.

2a: **Design Planning and Specification:** Define design requirements and constraints based on user needs, applicable standards, and contextual factors (e.g., safety, environmental, social, economic).

2b: **Conceptual Design and Selection:**

Generate multiple conceptual design alternatives and evaluate them systematically to select the most appropriate and effective solution.

3a: **Technical Communication – Visual and Written:** Convey technical information clearly and effectively through written reports and visual tools (e.g., drawings, graphs, models, schematics).

Prepared by: Assoc. Prof. Dr. Murat Sönmez

Date: February 2024

Edited: February, 2025

Edited: February, 2026