

Syllabus

Mechanical Engineering Program MECH 114 Computer Aided Engineering Drawing II (2-2) 3 (MUST Course)

Course ECTS Credit

6

Catalog Description

Details on Sectional Views, Geometric Tolerance; Feature control frame, tolerance zones, Symbols, Flatness, Straightness, Circularity, Concentricity, coaxiality, Position Control, Profile Tolerances, Run-out Control, Datum, datum features, simulated datum, Applications in Autodesk Inventor environment, Surface Texture; Characteristics and symbols, Assembly Modelling; mating methods, standard part library in Autodesk Inventor, assembly drawing, animation file, exploded views, Standard Structural Elements; tools of Inventor for creating solid model of structures, Weldments; tools of Inventor, welding drawings, welding symbols, Shafts; Inventor Shaft Generator, Bearings; Plain Bearings, Roller Bearings, Detail (Working) Drawings, Keys, Splines, Pins, Retaining Rings, Rivets, conventional views, Threaded Fasteners; Common Threaded Fasteners, bolts, nuts, cap screws, studs, Simplified Thread Representation, CAD applications in Autodesk Inventor environment, Common Loci; Cycloid, Involute, Gears; Gear Terminology, Spur Gears, Helical Gears, Bevel Gears, Racks, Worm Gears, Chain Drives, Working Drawings of gears, CAD Applications, Sheet-Metal Work, Intersections and Developments, Springs.

Prerequisite(s)

MECH 113 min.DD

Offered Semester:

Spring Semester (Regular)

Time Schedule:

Assoc. Prof. Dr. Murat Sönmez 2024-25 Academic Year 2nd Semester							
SCHEDULE							
Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
08:40 - 09:30							
09:40 - 10:30							
10:40 - 11:30	Office Hour						
11:40 - 12:30	MECH 114 [I-104]				Office Hour		
12:40 - 13:30	MECH 114 [I-104]						
13:40 - 14:30							
14:40 - 15:30			Office Hour				
15:40 - 16:30	MECH 100 [I-104]		ASE 492 [I-104]	MFAK SÖNMEZ	ASE 492 [I-104]		
16:40 - 17:30	MECH 100 [I-104]		ASE 492 [I-104]	MFAK SÖNMEZ	ASE 492 [I-104]		
17:40 - 18:30	MECH 113 [I-104]		MECH 533 [I-104]	MECH 114 [I-104]	MECH 113 [I-104]		
18:40 - 19:30	MECH 113 [I-104]		MECH 533 [I-104]	MECH 114 [I-104]	MECH 113 [I-104]		
19:40 - 20:30			MECH 533 [I-104]				

Reference books, Other Supplementary Materials

- * “Technical Drawing with Engineering Graphics” by Giesecke et al., 15th Ed., 2016, Pearson
- * “Engineering Drawing and Design” by Jensen/ Hesel/ Short, 7th Edition, 2008, Mc Graw- Hill.
- * “Tools for Design Using AutoCAD 2020 and Autodesk Inventor 2020” by Randy Shih, 2019,SDC Publications.
- * “Engineering Design and Graphics with Autodesk Inventor 2013”, by Bethune, J.,2014, Pearson Prentice Hall.
- *Autodesk Inventor 2010 Essentials Plus, by Banach, D. at.al., Delmar Cengage Learning.
- * “Makina Resmi”Şen, İ.Z., ve Özçilingir, N., Deha Yayıncılık, İstanbul, 2004.
- * “Teknik Resim, Cilt I, Cilt II”, Bağcı, M.,Birsen Yayınevi, İstanbul, 2000.
- * “Descriptive Geometry”, Pare, E.G., at al., MacMillan Pub. Co.
- *Lecture Notes at the web page of MECH114
<http://users.metu.edu.tr/sonmez/MECH%20114/MECH%20114home.htm> and also in METU Class
<https://odtuclass.metu.edu.tr/>

Course Learning Outcomes

a. *specific outcomes of instruction*

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

- (1) Distinguish for which parts/features special hatching rule is applied in creating sectional views, create removed, aligned sections, use tools of Autodesk Inventor to shoot some troubles in creating sectional views
- (2) 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
- (3) Describe surface texture, use tools of Autodesk Inventor, and explain the meaning of surface texture symbols
- (4) Draw/ create and read the detailed drawings (working drawings) of objects.
- (5) 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.
- (6) Create the solid model of structures using standard structural elements in Autodesk Inventor
- (7) Create solid models and engineering drawings of weldments using the tools of Autodesk Inventor
- (8) Create the solid model of shafts using the shaft generation tool of Autodesk Inventor
- (9) Create the solid models of keys, splines, pins, retaining rings, rivets, springs, bearings; plain bearings, roller bearings (particularly in Autodesk Inventor environment) and create and read the orthographic views of them, explain the meaning of their specification notes.
- (10) Create the solid models 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.
- (11) Create the solid models of gears; spur gears, helical gears, bevel gears, racks, worm gears, sprockets (particularly in Autodesk Inventor environment), create and read the working drawings of them.
- (12) Create the solid model of pipelines with the fitting elements and valves in Inventor
- (13) Create the solid model of pulley-belt mechanisms in Inventor

- (14) Create solid models of sheet-metal works, create developments (particularly in Autodesk Inventor environment)

Teaching Format

Two 50-minute lectures, two 50- minute applications, 10 hours' video watching per week.

Weekly Class and Tutorial Schedule

Week 1	Introduction, Review on Sectioning, special hatching rule, removed sections, aligned sections
Week 2- 3	Geometric Tolerances; Feature control frame, tolerance zones, Symbols, Flatness, Straightness, Circularity, Concentricity, Position Control, Profile Tolerance, Run-out Control, Datum and datum features, Applications Autodesk Inventor environment
Week 4	Surface Texture; Characteristics, symbols and CAD application
Week 5	Detail (Working) Drawing and Assembly Drawings; Introduction to Assembly Modeling in Autodesk Inventor Environment, Creation of animation/presentation files and exploded diagrams.
Week 6	Structures, Creation of Solid model of structures using standard structural elements in Autodesk Inventor
Week 7	Weldments, Creation of solid models and engineering drawings of weldments using the tools of Autodesk Inventor
Week 8-9	Creation of solid model of shafts using the shaft generation tool of Autodesk Inventor, Retaining Rings, Bearings, Keys, Splines and CAD applications
Week 10-11	Threaded Fasteners; Simplified Thread Representation, Common Threaded Fasteners, Applications in Autodesk Inventor environment
Week 12	Pins, Rivets, Springs, CAD applications
Week 13 - 14	Gears; Gear Terminology, Common Loci; Cycloid, Involute, Spur Gears, Helical Gears, Bevel Gears, Racks, Worm Gears, Chain Drives, Working Drawings of gears, CAD Applications
Week 14	: Sheet- Metal Work, Intersections and Developments

Computer Usage

The course is a computer-aided course. Autodesk AutoCAD and Inventor are used in drawing projections and creating solid models and their views, respectively.

Category Content

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

Grade Points:

Midterm Exam	: 40 %
Pop Quizzes, Quizzes & Term Project	: 30 %
Final	: 30 %

Attendance Requirement: Attend all the class sessions. The course topics are strongly related to each other. If you miss a session, make sure that you study the covered topic before you come to class for the following session. Do not wait until the main examinations. 80% attendance is mandatory. If your attendance is below 80% 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 CB if they accept that PQ grade will be substituted by the previous PQ grade)

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

Relationship to Performance Indicators

This course contributes to fulfillment of the following performance indicators:

- c3. Convert conceptual design into a form ready to be produced
- c4. Construct a functional prototype based on design documentation
- g1. Communicate using visual tools such as engineering drawings, graphics, diagrams, charts, plots, schematics, sketches, free body diagrams
- i1. Independently identify, utilize and evaluate publicly available resources such as internet, journals, patents, standards, tutorials, seminars, conferences, certificate courses
- k1. Use tools for 3D CAD modeling and fabrication/manufacturing
- k2. Use tools to prepare technical report, presentations, and graphics

Prepared by: Assoc. Prof. Dr. Murat Sönmez

Date: February, 2011

Modification Date: February 15, 2025