Beni Suef
Technological
University

CAD for Technicians

Syllabus

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Course Title: CAD for Technicians

Course Code: N/A

Course Followers:

Students of Mechatronics Department in 2nd semester of 1st year

Course Meeting Times

Labs: 1 session / week, 4 hours / session

Course Introduction

This course gives mechatronics students necessary knowledge and skills of the engineering drawing. This includes basic principles of drawing with such elements as diagrams, vertical projection, auxiliary projection, orthographic projection, sectioning, dimensioning, etc. Based on these, students will cultivate drawing and 2D design ability by way of computer-aided design tools (e.g. SolidWorks). The students are thereby led to experience the real mechanical parts/system drawing and designing through many hands-on cases. The students will be able to draw and design in 2D some mechanical elements according to industrial standard/specification

Course Objectives

After successfully studying this course, students will learn:

1. The basic knowledge of 2-D mechanical drawings such as types, sheets, scales, lines, lettering, sections, dimensioning, etc.
2. The basic principle of orthographic projection.
3. The basic knowledge of computer-aided design tool (e.g. SolidWorks) such as how to start, the system requirements to run, various modes, and important terms.
4. The basic knowledge of sketching work such as various terms used in the sketch environment and various sketch tools.
5. How to edit and modify sketches using various editing tools.
6. How to create the circular and the rectangular patterns of sketched entities.
7. Geometric relations in the sketched entities.
8. How to dimension the sketches and how to modify the dimensions of sketches.
9. The concept of fully defined sketches.
10. How to draw fully define the sketches.

Learning Outcomes

1. The working environment of CAD program (e.g. SolidWorks) can be prepared.
2. The views from orthographic projection can be obtained.
3. Using the function of the CAD program, the required shape can be drawn.
4. Using the function of the CAD program, the drawing elements can be modified and edited.
5. Using the function of the CAD program, geometric relation and dimensioning to the sketch can be applied.
6. Using the function of the CAD program, fully defined sketch can be obtained.

Prerequisites

Mathematics for Technicians

SolidWorks (Computer-aided design tool)

Textbooks

The course textbooks are:

1. Naguib G. Naguib, <u>CAD for Technicians (Practice Manual)</u>, BST, 2020.

Labs (or Tutorials/Exercise, Workshop)

· Labs will be conducted during the weeks shown in the schedule. Each lab assignment involves one or more accomplishments which must be checked off by an instructor in the lab. The instructor will be available for help and lab check-off during those weeks in which a lab is in progress.

· Students must successfully complete a series of lab assignment works throughout the course. The instructor will gather a collection of work that demonstrates evidence of a range of techniques in this course.

· Lab assignments must be done on your own. Skipping the lab and submitting work copied from someone else is a serious breach of ethics, and will be handled by the Committee on Discipline.

· Lab assignments will be graded on a scale of <u>0 to 3</u> (3: lab complete, works, good job on pre- and post-lab; 2: lab mostly complete, reasonable job on pre and post lab; 1: lab partially done, marginal to poor job on pre- and post-lab; 0: lab not done, poor job on pre- and post-lab).

Lab Books

· You must obtain the contents of a few pages for every lab (from Lab #1 to lab #15) for recording measurements, observations and graphs of data taken during the in-lab exercises.

· Written pre-lab and post-lab exercises are also to be completed in your own papers.

Midterm Exam

· One midterm exam for testing the learning outcomes will be given in this term. The exam will take place few days after Lab #7 for a four-hour duration.

· Students have to demonstrate that the learning outcomes from Lab #1 to Lab#7 have been achieved.

Final Exam

· A four-hour final exam will be given during the end-of-term exam week.

· Students have to demonstrate that the learning outcomes from Lab activities after the midterm exam had been achieved.

Calendar

The calendar provides information on the course's lab (Lab #), and exam (E) sessions.

SES #	TOPICS	KEY DATES
Lab #1	Introduction to SolidWorks	Lab report #1 in
Lab #2	Basic Knowledge of 2-D Mechanical Drawings	Lab report #1 out Lab report #2 in
Lab #3	Basic Principle of Orthographic Projection	Lab report #2 out Lab report #3 in
Lab #4	Drawing Lines	Lab report #3 out Lab report #4 in
Lab #5	Drawing Circles and Arcs	Lab report #4 out Lab report #5 in
Lab #6	Drawing Rectangles	Lab report #5 out Lab report #6 in
Lab #7	Drawing Various Entities	Lab report #6 out Lab report #7 in
E1	**Midterm Exam**	
Lab #8	Editing Sketched Entities	Lab report #7 out Lab report #8 in
Lab #9	Offsetting, Mirroring and Moving Sketched Entities	Lab report #8 out Lab report #9 in
Lab #10	Linear and Circle Patterns	Lab report #9 out Lab report #10 in
Lab #11	Applying Geometric Relations to Sketches	Lab report #10 out Lab report #11 in
Lab #12	Add Dimensions to Sketches	Lab report #11 out Lab report #12 in
Lab #13	Fully Defining the Sketches	Lab report #12 out Lab report #13 in

SES #	TOPICS	KEY DATES
E2	**Final Exam**	

Grading (or Assessment) Policy

Initial grading will be based on the following weighting:

ACTIVITIES	PERCENTAGES
Labs (performance & reports)	60%
Midterm Exam (Practice)	20%
Final Exam (Practice)	20%

- Lab assignments will be graded on a scale of <u>0 to 3</u>

    i)   3: lab complete, works, good job on pre- and post-lab;

    ii)   2: lab mostly complete, reasonable job on pre and post lab;

    iii)   1: lab partially done, marginal to poor job on pre- and post-lab;

    iv)   0: lab not done, poor job on pre- and post-lab.

- Midterm & Final Exam will be grade on a scale of <u>0 to 3</u> according to the degree of achievement in each learning outcome.

    i)   3: complete achievement in learning outcome;

    ii)   2: mostly complete, reasonable achievement in learning outcome;

    iii)   1: partially done, marginal to poor achievement in learning outcome;

    iv)   0: not done, poor achievement in learning outcome.

NO.	LEARNING OUTCOME	ASSESSMENT CRITERIA
1	The working environment of CAD program (e.g. SolidWorks) can be prepared.	a. Basic functions of CAD program (starting, modes, various Command Manager, save, etc.) can be understood and manipulated. b. The sketch working environment (snap, grid, unit, save, etc.) can be set
2	The views from orthographic projection can be obtained.	a. The basic knowledge of mechanical drawing (sheets, scales, lines, lettering, sections, dimensioning, etc.) can be understood. b. With understanding the basic principle of orthographic projection, the views of an object can be obtained. c. The number of views required to describe any object can be selected. d. With understanding principles of sectioning, the views in section can be represented.
3	Using the function of the CAD program, the required shape can be drawn.	a. The types and characteristics of lines can be understood and manipulated. b. The types and characteristics of circles and arcs can be understood and manipulated. c. The types and characteristics of rectangles can be understood and manipulated. d. The types and characteristics of other various entities can be understood and manipulated.
4	Using the function of the CAD program, the drawing elements can be modified and edited.	a. The drawing elements can be modified (trim, fillet, etc.). b. The drawing element can be edited (copy, move, pattern, offset, etc.).
5	Using the function of the CAD program, geometric relation and dimensioning to the sketch can be applied.	a. The geometric relation to the sketch can be understood and manipulated. b. Dimensions can be understood and applied to the sketch.
6	Using the function of the CAD program, fully defined sketch can be obtained.	a. Fully defined sketch can be understood and drawn. b. Sketches can be repaired.

· This will be followed by considerable discussion among the entire teaching staff to factor in your diligence on the labs, and your participation in class and labs. This discussion can affect your letter grade for the course, particularly if your initial grade is on a letter-grade boundary.

Lab notes (or Practice Manual)

This section contains lab notes from every chapter of the practice manual, "1. Naguib G. Naguib, CAD for Technicians (Practice Manual), BST, 2020"

LAB #	TOPICS	LAB NOTES (PRACTICE MANUAL CHAPTER)
Lab #1	Introduction to SolidWorks Starting a New Drawing System Requirements to run SolidWorks Various Modes of SolidWorks Various Command Managers of SolidWorks Various Important Terms in SolidWorks Save files in SolidWorks Color Schemes in SolidWorks Exercises	Module 1 Chapter 1
Lab #2	Classification of Drawings - Machine Drawing, Production Drawing, Assembly Drawing Principles of Drawings - Drawing Sheet, Scales, Lines, Lettering, Sections, Conventional Representation, Dimensioning Exercises	Module 2 Chapter 1
Lab #3	Orthographic Projections - Types, Details of Orthographic Projection, Position of the Object, Selection of Views Sectional Views - Full Section, Half Section, Auxiliary Section Exercises	Module 2 Chapter 2
Lab #4	Sketching Environment New Part Document Various Terms in the Sketching Environment Drawing Lines - Line, Centerline, Midpoint Line Snap, Grid, and Units Settings Saving the Sketch Tutorials	Module 3 Chapter 1

LAB #	TOPICS	LAB NOTES (PRACTICE MANUAL CHAPTER)
	Exercises	
Lab #5	Drawing Circles and Arcs - Circle, Perimeter Circle - Centrepoint Arc, Tangent Arc, 3 Point Arc Tutorials Exercises	Module 3 Chapter 2
Lab #6	Drawing Rectangles - Corner Rectangle, Center Rectangle, 3 Point Corner Rectangle, 3 Point Center Rectangle, Parallelogram Tutorials Exercises	Module 3 Chapter 3
Lab #7	Drawing Slots - Straight Slot, Centrepoint Straight Slot, 3-point Arc Slot, Centrepoint Arc Slot Drawing Polygon Drawing Splines - Spline, Style Spline, Equation Driven Curve Drawing Quadratic curves - Ellipse, Partial Ellipse, Parabola, Conic Tutorials Exercises	Module 3 Chapter 4
Lab #8	Trim/Extend Entities - Trim Property Manager: Power trim, Corner, Trim away inside, Trim away outside, Trim to closet Sketch Fillet/Chamfer Text Tutorials Exercises	Module 4 Chapter 1
Lab #9	Offset Entities Mirror Entities Move Entities - Move Entities, Copy Entities, Rotate Entities, Scale Entities, Stretch Entities	Module 4 Chapter 2

LAB #	TOPICS	LAB NOTES (PRACTICE MANUAL CHAPTER)
	Tutorials Exercises	
Lab #10	Linear Sketch Pattern Circle Sketch Pattern Tutorials Exercises	Module 4 Chapter 3
Lab #11	Adding Geometric Relation to the Sketch - Add Relation Property Manager - Horizontal, Vertical, Collinear, Cordial, Perpendicular, Parallel, ParallelYZ, ParallelZX, AlongZ, Tangent, Concentric, Intersection, Coincident, Midpoint, Symmetric, Fix, Merge, Pierce Display/Delete Relations Tutorials Exercises	Module 5 Chapter 1
Lab #12	Applying Dimensions to the Sketch - Smart Dimension - Horizontal Dimension, Vertical Dimension, Ordinate Dimension, Horizontal Ordinate Dimension, Vertical Ordinate Dimension, Path Length Dimension Modifying Dimension Tutorials Exercises	Module 5 Chapter 2
Lab #13	Fully Defining the Sketches Repairing the Sketches Tutorials Exercises	Module 6 Chapter 1