MNE3007: CAD/CAM

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
CAD/CAM

Subject Code
MNE - Mechanical Engineering
Course Number
3007

Academic Unit
Mechanical Engineering (MNE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
ADSE2010/SYE2010 Fundamental Engineering Analysis and Design for Manufacturing Engineers I OR
BME2109/MNE2109 Engineering Mechanics AND
MNE2016 Engineering Graphics or
MNE2116 Engineering Graphics

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to develop an understanding of the basic principles underlying Computer Aided Design and Manufacture. Students will learn how to apply CAD/CAM technology in a design and manufacturing environment.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the mathematical basis in the representation of geometric entities including points, lines, and parametric curves, surfaces and solid, transformation of geometric entities using transformation matrices.		x	x	
2	Describe key concepts in CNC machining and part programming, apply geometric operations for tool path generation and define key parameters for cutter location definition.			x	x
3	Describe key neutral format specifications and standards for product data exchange.			x	
4	Apply the knowledge in representation and transformation techniques to create programming codes that generate and transform geometric entities.			x	
5	Apply basic modelling operations to construct simple geometric model of engineering parts and to produce typical tool paths using a CAD/CAM software.			x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures covering four major areas, including CAD fundamentals, CAD modelling, CNC tool path generation, and CAD data exchange.	1, 2, 3	2 hrs/week

2	Laboratory Work	Hands-on exercises on CAD modelling and CNC tool path extraction, and structured programming exercises on geometric entity representation and transformation.	4, 5	3 hrs/week for 5 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments and Test	1, 2, 4, 5	20	3 assignments	Yes
2	Laboratory Exercises	4	20	2 sets of exercises to be completed and submitted	Yes

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2.5

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignments and Test

Criterion

Ability to describe and elaborate CAD fundamentals, basics of CAD modelling and NC tool path generation.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Laboratory Exercises

Criterion
Familiarization of CAD modelling and NC tool path extraction through hands-on activities, and formulate and create programming code for generating and transforming geometric objects.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Examination

Criterion
Ability to explain and elaborate CAD fundamentals, such as model, coordinate and view transformations, the basics of CAD modelling, including curve, surface and solid modelling, and various approaches for CNC tool path generation, and an ability to describe major solutions for interfacing different CAD/CAM systems.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Additional Information for AR

Note: For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Part III Other Information

Keyword Syllabus

- Key components of CAD systems and basic operations of CAD modelling.
- Representation of geometric entities including points, lines, and parametric curves and surfaces.
- Techniques of transformation of geometric entities using transformation matrices.
- Basic solid modeling techniques.
- Basic concepts in CNC machining and part programming.
- Fundamentals in toolpath generation.
- Neutral format interfaces (standards) for CAD data exchange.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Rogers D F & Adams J A, “Mathematical Elements for Computer Graphics”, McGraw-Hill, 1989.
2	Shah J J & Mantyla M, “Parametric and feature-based CAD/CAM”, John Wiley & Sons, 1995.
3	Zeid I, “CAD/CAM Theory and Practice”, McGraw-Hill, 1991.
4	Alavala C R, “CAD/CAM: Concepts and Applications”, PHI Learning Pvt. Ltd., 2008.
5	Hoschek J and Lasser D, “Fundamentals of Computer Aided Geometric Design”, A.K. Peters, Wellesley, Massachusetts, 1993.
6	Lee K, “Principles of CAD/CAM/CAE”, Addison Wesley Longman, Reading Massachusettes, 1999.
7	Kumar K, Zindani D & Davim J P, “Mastering SolidWorks - Practical Examples”, Springer Nature Switzerland, 2020.
8	Computer-Aided Design Journal, recent issues, Elsevier Science.