

# MNE3007: CAD/CAM

---

## Effective Term

Semester A 2024/25

## 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 (e.g. Parameter for GenAI use)	
1	Assignments and Test	1, 2, 4, 5	20	3 assignments
2	Laboratory Exercises	4	20	2 sets of exercises to be completed and submitted

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2.5

**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.