MNE6001: CAD/CAM INTEGRATION

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
CAD/CAM Integration

Subject Code
MNE - Mechanical Engineering
Course Number
6001

Academic Unit
Mechanical Engineering (MNE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
MNE8112 CAD/CAM/CAE Integration

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to develop a comprehensive understanding of technology underlying Computer Aided Design and Manufacture. Students will learn how to apply CAD/CAM technology to solve design/manufacturing problems with a significant geometric component.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	describe the mathematical basis in the technique of representation of geometric entities including parametric curves and free-form surfaces.		x	x	
2	describe the basic theories and algorithms for solid modelling and other advanced representation schemes.		x	x	
3	describe the techniques in CNC toolpath computation for 3-axis and multi-axis machining, feature recognition and selected topics in advanced CAD/CAM applications.		x	x	
4	apply relevant techniques to design algorithms for simple CAD/CAM operations.			x	x
5	interpret a design/manufacturing problem with a significant geometric component, translate it into an algorithmic problem, and apply relevant techniques to solve it.			x	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 three major areas on CAD modelling, CAM processing, and 3D printing.	1, 2, 3, 4, 5	2 hrs/week
2	Tutorial	Tutorials on CAD modelling, including spline-based modelling, subdivision-based modelling and solid modelling.	1, 2, 4, 5	1 hr/week for 8 weeks

3	Mini-project	Mini-projects covering various topics on CAM, 3D printing and other closely related topics.	3, 4, 5	1 hr/week for 5 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment / Test	1, 2, 4, 5	15	
2	Mini-project	3, 4, 5	25	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

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

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Through examination, the students will be evaluated on the knowledge in the fields of CAD/CAM integration.

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

Assignment/ Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Tutorials mainly covering various topics of lectures on CAD modelling and processing.

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
Mini-project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Mini-projects mainly covering topics on CAM processing, 3D printing, and other closely related topics.

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 (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Through examination, the students will be evaluated on the knowledge in the fields of CAD/CAM integration.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task
Assignment/ Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Tutorials mainly covering various topics of lectures on CAD modelling and processing.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Not even reaching marginal levels

Assessment Task
Mini-project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Mini-projects mainly covering topics on CAM processing, 3D printing, and other closely related topics.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
CAD/CAM systems, Bezier, B-spline and NURBS for curve and surface modelling, subdivision-based modelling, CSG and B-Rep for solid modelling, algorithms for curve/curve intersection, curve/surface intersection and surface/surface intersection, algorithms for point membership classification and boundary evaluation, algorithms for 3-axis and multi-axis toolpath extraction, data processing for 3D printing.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	David F. Rogers, "An Introduction to NURBS: with Historical Perspectives", Academic Press, San Francisco, 2001.
2	G. Farin, "Curves and surfaces for CAGD: a practical guide", Morgan Kaufmann Publishers, Academic Press, San Diego, 2002.
3	I. Zeid, "Mastering CAD/CAM with Engineering Subscription Card", McGraw-Hill, 2004.
4	I. Gibson, D. Rosen and B. Stucker, "Additive Manufacturing Technologies - 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer-Verlag New York, 2015.
5	Computer-Aided Design Journal, Elsevier Science.