City University of Hong Kong
Course Syllabus

offered by
Department of Mechanical Engineering
with effect from Semester B 2019 / 2020

Part I Course Overview

Course Title:	CAD/CAM Integration
Course Code:	MNE6001
Course Duration:	1 semester
Credit Units:	3 credits
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites : *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	MBE6001 CAD/CAM Integration **OR** MNE8112 CAD/CAM/CAE Integration
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. 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.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	**describe** the mathematical basis in the technique of representation of geometric entities including parametric curves and free-form surfaces.		✓	✓	
2.	**describe** the basic theories and algorithms for solid modelling and other advanced representation schemes.		✓	✓	
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.		✓	✓	
4.	**apply** relevant techniques to **design** algorithms for simple CAD/CAM operations.			✓	✓
5.	**interpret** a design/manufacturing problem with a significant geometric component, **translate** it into an algorithmic problem, and **apply** relevant techniques to solve it.			✓	✓
		N.A.			

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	Lectures covering three major areas on CAD modelling, CAM processing, and 3D printing.	✓	✓	✓	✓	✓	2 hrs/week
Tutorial	Tutorials on CAD modelling, including spline-based modelling, subdivision-based modelling and solid modelling.	✓	✓		✓	✓	1 hr/week for 8 weeks
Mini-project	Mini-projects covering various topics on CAM, 3D printing and other closely related topics.			✓	✓	✓	1 hr/week for 5 weeks

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment: 40%							
Assignment / Test	✓	✓		✓	✓	15%	
Mini-project			✓	✓	✓	25%	
Examination: 60% (duration: 2 hours)							
Examination	✓	✓	✓	✓	✓	60%	
						100%	

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Through examination, the students will be evaluated on the knowledge in the fields of CAD/CAM integration.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Assignment/ Test	Tutorials mainly covering various topics of lectures on CAD modelling and processing.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Mini-project	Mini-projects mainly covering topics on CAM processing, 3D printing, and other closely related topics.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

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.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

None

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

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.