

The Hong Kong Polytechnic University
Hong Kong Community College

Subject Description Form

Subject Code	SEHH3144
Subject Title	Computer Aided Engineering Design
Level	3
Credit Value	3
Medium of Instruction	English
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite SEHH2248 Engineering Design Fundamentals
Objectives	The aims of this subject are twofold: (1) to teach the fundamental theories and basic concepts underlying today's technologies in computer-aided design (CAD), computer-aided manufacturing (CAM), and computer-aided engineering (CAE), and (2) to provide hands-on opportunities and training for students on the use of some professional CAD/CAM software. By receiving a thorough fundamental theoretical training and mastering real CAD/CAM/CAE software, students will be equipped and confident to solve difficult problems in design and manufacturing.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) describe the working principles of CAD/CAM/CAE techniques as tools in the engineering design environment; (b) apply CAD/CAM/CAE systems in product development; (c) analyse solutions for engineering problems using simulation software; (d) apply background knowledge or newly obtained information to investigate possible outcomes for engineering problems.
Subject Synopsis/ Indicative Syllabus	CAD/CAM/CAE Systems Overview of CAD, CAM, and CAE; Basic concepts of graphics programming; Computer-aided design/drafting systems; Geometric modelling systems. Numerical Control (NC) Machining and Tool Path Generation Algorithms Types of NC systems; Basic concepts of part programming; Manual part programming; Computer-assisted part programming; 2D pocket machining; Lathe machining.

	Finite Element Analysis (FEA) Basic concepts of FEA; Applications of FEA; Stress analysis; Motion study. Design for Manufacturability (DFM) and Design for Assembly (DFA) Overview; Computed-aided DFM; Design for cost; Assembly methods and processes; Computer-aided DFA method(s). Rapid Prototyping and Manufacturing (RP&M) RP&M processes; Applications of RP&M; Stereo lithography processes.																																														
Teaching/Learning Methodology	Lectures will focus on introducing the essential knowledge and concepts underlying today’s technologies in computer-aided design (CAD), computer-aided manufacturing (CAM), and computer-aided engineering (CAE). Tutorials will provide students with the opportunity to practise and apply their knowledge gained from lectures with hands-on experiences in using the software used in the industry.																																														
Assessment Methods in Alignment with Intended Learning Outcomes	A variety of assessment tools will be used to develop and assess students’ achievement of the subject intended learning outcomes. <table><tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="4">Intended subject learning outcomes to be assessed</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>Continuous Assessment*</td><td>100</td><td colspan="4"></td></tr><tr><td>▪ Test</td><td>20</td><td>✓</td><td>✓</td><td></td><td></td></tr><tr><td>▪ Assignment 1</td><td>20</td><td>✓</td><td>✓</td><td></td><td></td></tr><tr><td>▪ Assignment 2</td><td>20</td><td>✓</td><td></td><td></td><td>✓</td></tr><tr><td>▪ Group Project</td><td>40</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="4"></td></tr></table> <i>*Continuous assessment items and/or weighting may be adjusted by the subject team subject to the approval of the College Programme Committee.</i> To pass this subject, students are required to obtain Grade D or above in the Continuous Assessment.	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				a	b	c	d	Continuous Assessment*	100					▪ Test	20	✓	✓			▪ Assignment 1	20	✓	✓			▪ Assignment 2	20	✓			✓	▪ Group Project	40	✓	✓	✓	✓	Total	100				
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▪ Assignment 2	20	✓			✓																																										
▪ Group Project	40	✓	✓	✓	✓																																										
Total	100																																														

Student Study Effort Expected	Class contact	Hours
	▪ Lecture	13
	▪ Tutorial	26
	Other student study effort	
	▪ Self-study	52
	▪ Continuous Assessment	39
	Total student study effort	130
Reading List and References	References Boothroyd, G., Dewhurst, P., and Knight, W. A. (2011). <i>Product Design for Manufacture and Assembly</i> . CRC Press. Chang, K. H. (2014). <i>Product design modelling using CAD/CAE: the computer aided engineering design series</i> . Academic Press. Gibson, I., Rosen, D., and Stucker, B. (2015). <i>Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing</i> . Springer. Pande, S. S. (2012). <i>Computer graphics and product modeling for CAD/CAM</i> . Alpha Science International Ltd. Ulrich, K. T. & Eppinger S. D. (2016). <i>Product Design and Development</i> . McGraw-Hill Education.	