Subject Description Form

Subject Code	ME42008
Subject Title	Computer-Aided Technology for Design
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME32001 Manufacturing Fundamentals; or ME32003 Design and Manufacturing Exclusion: ME42005 CAD/CAE Technologies for Product Development
Objectives	1. To provide students advanced knowledge on the computer-aided related technologies for product design and development. 2. To provide students advanced knowledge on the principles and applications of computer-aided modelling and analysis. 3. To provide students advanced knowledge on the use of computer-aided techniques and software to solve structural, stress, heat transfer and dynamic problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Use the computer-aided techniques to facilitate the process of product design and development. b. Understand the interface among CAD, CAE and CAM during the product design process by using up-to-date software. c. Identify a set of design variables and the governing equations to analyze a conceptual design. d. Optimize the mesh size and type and apply appropriate types of boundary constraints in the CAE process. e. Analyze and optimize a design with the aid of modern CAE software.
Subject Synopsis/ Indicative Syllabus	***Computer-aided Modelling*** - Geometric Models of Products - Mathematical Modelling • Curve Modelling • Surface Modelling • Solid Modelling - 3-D Product Analysis - Modelling and Simulations - Product Animation ***Design Analysis and Evaluation*** - Finite Element Modelling and Analysis • Modelling Techniques • Mesh Types • Boundary Constraints • Material and Property Types - Mathematical Modelling

- Mechanical and Thermal Stress Analyses
- Dynamic Response
- Product Optimizations (Size and Shape)
- Non-linear Stress Analysis

CAD/CAE/CAM Integration

- Interface between CAD/CAE/CAM
- Applications of CAD/CAE/CAM

Teaching/Learning Methodology

Lectures will be given to explain the theories behind CAD, CAE and CAM.

Tutorials will be used to teach the students how to conduct design analysis and evaluation after finishing the process of computer-aided modeling using state-of-the-art software such as SolidWORKS, ANSYS. Students will be given sets of exercises to learn how to evaluate the structural strength, vibration frequencies of a product, the response to thermal stresses and drop test and the parameters involved in product optimization.

A mini-project will be given to students so that they will go through all the phases of a design process using computer-aided technology to achieve the design objectives.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lecture		√	√	√	
Tutorial	√		√	√	√
Case study			√		√
Mini-project	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Class test	20 %	√	√	√	√	√
2. Written/computer assignment	10 %	√	√	√	√	√
3. Case study	10 %			√		√
4. Mini-project report/presentation	10 %	√	√	√	√	√
5. Examination	50 %	√		√	√	
Total	100 %					

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.5 × End of Subject Examination + 0.5 × Continuous Assessment

	Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests, written and computer assignments which provide timely feedbacks to both lecturers and students on various topics of the syllabus. Written reports on various case studies and mini-project are used to assess the students' knowledge in the application of state-of-the-art CAD/CAE software to facilitate the product design and analysis process. Mini-project report and presentation assess the students' ability to assimilate the learnt knowledge for solving a more realistic, open-ended design problem systematically.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	29 Hrs.
	▪ Tutorial	4 Hrs.
	▪ Guided study of CAD/CAE	6 Hrs.
	Other student study effort:	
	▪ Performing CAD/CAE in design (tutorial problems)	23 Hrs.
	▪ Performing modeling of design problems (case studies and mini-project)	24 Hrs.
	▪ Literature search and private study	20 Hrs.
	Total student study effort	106 Hrs.
Reading List and References	1. Michael E. Mortenson, Geometric Modeling, John Wiley & Sons, latest edition. 2. Kunwoo Lee, Principles of CAD/CAM/CAE System, Addison-Wesley Longman, latest edition. 3. Vince Adams and Abraham Askenazi, Building Better Products with Finite Element Analysis, Onword Press, latest edition.	

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