

Subject Description Form

Subject Code	ME49003
Subject Title	Capstone Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME31003 System Dynamics; ISE386 Integrated Design for Manufacture or ME32001 Manufacturing Fundamentals; ME33001 Mechanics of Materials; ME34003 Thermofluid Mechanics; and ME41004 Mechatronics and Control
Objectives	To provide students an opportunity to utilize and integrate their knowledge of engineering, design and marketing in completing a real-life product design engineering project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: <ul style="list-style-type: none"> a. Formulate a design problem addressing certain market needs and to develop design specifications with due consideration of industrial design. b. Generate alternative design concepts, and then evaluate each of these concepts by considering the impacts of various important factors including human factors, materials used, manufacturing processes, quality and environmental issues, health and safety on product design and development. c. Apply arts, mathematics, information technology and engineering sciences via analytical, computational and experimental approaches to realize a selected design concept. d. Work effectively and make contributions independently in a multi-disciplinary design project team, and apply project management technique to ensure successful competition of the design project. e. Understand the importance of life-long learning and perform literature search to upkeep with the state-of-the-art product design technology. f. Present a design project via oral presentation and written report.
Subject Synopsis/ Indicative Syllabus	<p><i>In-depth Study of Substantial Design Tasks</i> - Marketing survey; Alternative conceptual design; Engineering design and analysis; Product safety and reliability; Product testing techniques; Prototyping and development technologies.</p> <p><i>Areas of Design Project</i> - Toys; Home appliances; Electronic and electrical appliances; Bio-medical equipment; Plastic and metallic products; Green products; Health products; Computer-aided technology for product development; Products for specialists.</p> <p><i>Knowledge and Skills Required for Performing Design Project</i> - Problem identification; Literature review; Methodology for data analysis; Engineering design and analysis; Design concept generation; Safety and risk analysis; Prototyping technology; Project management; Report writing and presentation skill.</p>

Teaching/Learning Methodology

Normal Study Pattern

1. Guidance will be given to students during the whole design project. (Outcomes a to d)
2. Regular group discussions with the supervisor (and the industrial supervisor for an industrial-based project) to ensure the correct direction and focus of the project. (Outcomes a to e)
3. The interim report aims at ensuring the proper progress of the project.
4. The final report aims at examining the completeness, quality, workability, practicability and engineering content of the product being designed and developed.
5. Prototype and/or computer-aided simulation will be conducted to show the functionality and safety of the product being designed and developed. (Outcomes a to f)
6. Oral examination will be conducted to examine the presentation skill, ability to provide prompt response to a question and understanding of the whole design project.

Cooperative Education (Co-Op) Study Pattern

1. Guidance will be given to students during the whole design project. (Outcomes a to d)
2. Regular meetings with the academic/industrial supervisor to ensure the correct direction and focus of the project. (Outcomes a to e)
3. The interim report aims at ensuring the proper progress of the project.
4. The final report aims at examining the completeness, quality, workability, practicability and engineering content of the product being designed and developed.
5. Prototype and/or computer-aided simulation will be conducted to show the functionality and safety of the product being designed and developed. (Outcomes a to f)
6. Oral examination will be conducted to examine the presentation skill, ability to provide prompt response to a question and understanding of the whole design project.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Tutorial	√	√	√	√		
Group Discussion	√	√	√	√	√	
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	f
1. Continuous monitoring	15%	√	√	√	√	√	
2. Interim report	10%	√	√	√			√
3. Final report	50%	√	√	√	√	√	√
4. Oral presentation	25%	√	√	√	√	√	√
Total	100%						

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

Overall Assessment:
1.0 x Continuous Assessment.

Normal Study Pattern

1. Performance of each student should be assessed individually together with the team's overall performance by the supervisor, an independent assessor, the peers and an examination panel consisting of at least three academic staff. The following criteria should normally be used for performance assessment:
 - i. Innovative approaches in generating alternative design concepts to meet market need;
 - ii. Functionality, workability, practicability and engineering content of the final design;
 - iii. General attitude, initiative and effectiveness in making progress;
 - iv. Engineering design and analysis, and work accomplishment;
 - v. Quality of the interim and the final report;
 - vi. Performance during the oral examination.
2. The continuous monitoring of a project group as a whole and that of each group member on an individual basis are conducted by the supervisor. The interim report is assessed by the independent assessor. The final report is assessed by both the supervisor and the independent assessor. As part of the assessment process, each group member is required to specify his/her own contribution in completing the project when compared to his/her team mates (peer assessment). In case of an industrial-based project, comments will be invited from the industrial supervisor but he/she will not be required to perform the formal assessment.
3. The supervisor monitors and assesses the overall and individual progresses through regular meetings. The interim report should be submitted to the independent assessor around week 8 of the first semester. The final report submitted before the end-of-year examination is assessed by both the supervisor and the independent assessor. Deal consideration of each student's individual contribution and performance will be taken into account.
4. During the oral examination, every group member is required to present the project especially on his/her significant contribution to the whole project, and respond to the questions addressed to him/her by the examination panel. Marks for oral examination are awarded to individual student by taking into account the group's overall performance.

Co-Op Study Pattern

1. Performance of each student should be assessed individually by the academic supervisor, the industrial supervisor from the collaboration company, an independent assessor and an examination panel consisting of at least three academic staff. The following criteria should normally be used for performance assessment:
 - i. Innovative approaches in generating alternative design concepts to meet customer and/or market need agreed by academic and industrial supervisors;
 - ii. Functionality, workability, practicability and engineering content of the final design;
 - iii. General attitude, initiative and effectiveness in making progress;
 - iv. Engineering design and analysis, and work accomplishment;
 - v. Quality of the interim and the final report;
 - vi. Performance during the oral examination.

2. The continuous monitoring of student is conducted by the academic supervisor and industrial supervisor. The interim report is assessed by the independent assessor. The final report is assessed by the academic supervisor, the industrial supervisor and the independent assessor. As part of the assessment process, student is required to specify his/her own contribution in completing the industrial project in the collaboration company.
3. The supervisors monitor and assess the overall and individual progresses through regular meetings. The interim report should be submitted to the independent assessor around week 5 of the first semester. The final report submitted before the end of first semester of academic year and is assessed by the academic supervisor, the industrial supervisor, and the independent assessor.
4. During the oral examination, student is required to present the project especially on his/her significant contribution to the whole project, and respond to the questions addressed to him/her by the examination panel.

The assessment system for both normal and co-op study pattern is summarized as shown in the following table:

Assessor	Assessment Component (% of the total)				
	Continuous Monitoring (15)	Interim Report (10)	Final Report (25)	Final Report (25)	Oral Examination (25)
Supervisor	√		√		
Independent Assessor		√		√	
Examination Panel					√

Student Study Effort Expected	Class contact:	
	▪ Guided study	26 Hrs.
	Other student study effort:	
	▪ Conducting project	154 Hrs.
	▪ Literature search and private study	72 Hrs.
	Total student study effort	252 Hrs.
	Students will be guided to search relevant references by the supervisor.	
Reading List and References	To be advised by supervisor.	