Subject Description Form

Subject Code	ME32001
Subject Title	Manufacturing Fundamentals
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME22001 Engineering Design Fundamentals, or ME32002 Engineering Design Fundamentals, and ME23001 Engineering Mechanics
Objectives	To provide students with the fundamental knowledge of manufacturing processes and to teach students on how to apply manufacturing processes in product design and development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the basic working principles and rationales of common manufacturing processes and the related tooling for product development. b. Select appropriate manufacturing processes for product fabrication at up-front design stage. c. Present the completed mini-project related to manufacturing.
Subject Synopsis/ Indicative Syllabus	***Machining*** **-** The principle, operation, mechanisms and the related machines of boring, drilling, facing, grinding, milling, planning, turning, sawing, ECM and EDM. ***Finishing*** **-** The principles and realization of anodizing, honing, painting, plating and polishing and their related facilities. ***Bulk Plastic Deformation*** **-** The principles, rationales and realization related to facilities of extrusion, forging, rolling, bar drawing, wire drawing processes. ***Sheet Metal Forming*** **-** The principles, design rationales and the process realization of drawing, blanking, bending, punching, shearing and spinning processes. ***Casting*** **-** The operation, realization and principles of die casting, investment casting, permanent mold casting, sand casting, and centrifugal casting. ***Polymer Processing*** **-** The process, principles and the realization of blow molding, casting, compression molding, extrusion, injection molding, and thermoforming. ***Assembly*** **-** Introduction to the process principle of welding (fusion, brazing & soldering, solid state), adhesive bonding and mechanical fastening. Process determination, die and tooling design, plastic deformed components design and product quality for bulk metal forming, sheet metal forming, casting and polymer processing.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge related to conventional and advanced manufacturing processes. (Outcomes a – b).

Tutorials and case studies are used to illustrate the application of fundamental knowledge to practical situations (Outcomes a – c).

Mini-project/study report is used to enhance the understanding and use of the learned knowledge (Outcomes a – c).

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lecture	√	√	
Tutorials	√	√	√
Mini-project	√	√	√
Study report	√	√	√

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
1. Test and quizzes	20 %	√	√	
2. Mini-project report	15 %	√	√	√
3. Presentation of the mini-project	15 %	√	√	√
4. Examination	50 %	√	√	
Total	100 %			

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

Overall Assessment:

$0.5 \times$ End of Subject Examination + $0.5 \times$ Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the test, quizzes, mini-project report and presentation which provide timely feedbacks to both lecturers and students on various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture and seminar	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Performing mini-projects/study report	20 Hrs.

	▪ Course work	23 Hrs.
	▪ Literature search and private study	22 Hrs.
	Total student study effort	104 Hrs.
Reading List and References	1. S. Kalpakjian, S. Schmid, manufacturing engineering and technology, Prentice Hall, latest edition. 2. B. Benhabib, Manufacturing: Design, Production, Automation and Integration, Marcel Dekker, latest edition. 3. J.Y.H. Fuh, Y.F. Zhang, A.Y.C. Nee, M.W. Fu, Computer-aided injection mold design and manufacture, Marcel Dekker, Inc, latest edition. 4. Jiri Tlusty, Manufacturing processes and equipment, Prentice Hall, latest editon. 5. Robert H. Wagoner, Jean-Loup Chenot, Fundamental of metal forming**,** New York: Wiley, latest editon. 6. MW Fu, Design and development of metal-forming processes and products aided by finite element simulation, Springer, 2017	

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