The Hong Kong Polytechnic University

Subject Description Form

Subject Code	BME21303/IC2138 *(pending approval)*
Subject Title	Material Processing and Fabrication Technique
Credit Value	3 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objective of this subject is to enable students to learn the materials, equipment and processes employed in industry on material processing and how different processes can be grouped to generate different classes of geometry. From this subject, students acquire basic practical knowledge and skills in occupational health and safety, materials processing, fabrication processes, basic measurement techniques and basic PCB design and fabrication.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain the general duties related to occupational safety and identify common workplace hazards and corresponding control measures, andincident and emergency handling; b. Select and use common hand tools and appropriate machining and fabrication processes for basic engineering measurement, marking out, materials processing, bench fitting, materials jointing and parts assemblywork; c. Demonstrate an understanding of the limitations of materials that affectthe application, sustainability requirements, manufacturing processes and workflow to produce a designed product assembly in realizing the importance of tolerance; d. Recognize the basic concept of schematic capture; produce electronic schematics from scratch or design draft, and prepare a file for printing ofPCB layout; and e. Fabricate PCB and build electronic assemblies and integrate electronic'Modules with other electro-mechanical parts.
Subject Synopsis/ Indicative Syllabus	1. Occupational Safety General duties related to occupational safety. Safesystems of work. Common hazards in workplace and correspondingcontrol measures: risk control strategy, job safety analysis, manual handling, hazards arising from noise, electricity, fire, and chemicals, and associated control. Machinery hazards and principles of guarding. Incident and emergency handling: emergency preparedness, responses, follow-up actions.

2. Material Processing

Introduction of materials. Use of common hand tools, i.e. files, hacksaw, hammer, drill, scriber, taps, die, reamer, surface plate, vee-block. Marking out principle and bench work. Use of basic machining tools. Plastics forming and cutting. Silicone rubber mould production and resin casting. Sheet metal fabrication. Materials finishing and jointing. 3D Scanning and digital sculpting. Basic measurement skills, i.e. Use of Vernier Calipers, Micrometer, Height Gauge, etc.

3. Basic Electronics

Introduction to electronics and its products. Introduction to electronic circuits and components. Soldering and de- soldering techniques and Surface Mount Technology appreciation. Selection of electronic tools and materials. PCB design. Use of basic electronic tools and equipment. Mounting and installation of electronic circuits, wiring of electronic assemblies, prototype making, electronic circuit trouble shooting techniques.

Teaching/ Learning Methodology

- The learning & teaching methods include mini lectures, demonstration, workshop practice with technical tasks.
- Mini lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, application of computer aided design systems, use of standard engineering components and systems, selected manufacturing processes and importance of industrial safety.
- The demonstration and workshop practices are aimed at enhancing students' practical knowledge and ability in applying the knowledge and skills of selected manufacturing processes to complete specific tasks.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1 Individual workshop assignments	70	✓	✓	✓	✓	✓
2. Quizzes	30					
Total	100	✓	✓		✓	

Individual workshop assignments in the form of small manufacturing taskswill be used to assess how well students understand the working principle,capabilities, and operation of the manufacturing processes. Students' skill-level will be evaluated by the artefacts they produced, while their critical thinking and work attitude be evaluated by individually filled task worksheets.

	Online Quizzes in multiple-choices/ short-question type will used to assess students broadly the students' understanding of declarative knowledge covered by the subject, as well as their material and process selection judgement.	
Student Study Effort Expected	Class Contact	
	▪ Mini lecture, In-class Assignment/ Hands-on Practice	120 Hrs.
	Other Student Study Effort	0 Hrs.
	Total Student Study Effort	120 Hrs.
Reading List and References	1) Training material, manual and articles published by Industrial Centre. 2) "Engineering fundamentals & problem solving" (2012) A. R. Eide, New York, NY: McGraw-Hill	
Last Updated	January 2025	