

Subject Description Form

Subject Code	IC2110
Subject Title	Integrative Engineering Project
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	<p>Integrative Engineering Project uses an integrative project as a vehicle to provide the students with a basic appreciation of the selection, design and application of materials, equipments and manufacturing processes for fabrication of a teaching Biomechatronic device. Through the project, students acquire basic practical knowledge and skills in occupational health & safety, engineering drawing and CAD, material processing, fabrication processes and basic PCB design and fabrication for electronic products.</p>
Intended Learning Outcomes	<ul style="list-style-type: none">a) Exercise and further develop teamwork, leadership, critical thinking and problem solving skills.b) Explain the general duties related to occupational safety and identify common workplace hazards and corresponding control measures, and incident & emergency handling.c) Interpret and produce 2D orthographic engineering drawing used for the representation of 3D object; computer aided design CAD applications in construction of 3D objects, assembly of 3D objects; generation of 2D engineering drawings from 3D objects and assembly of 3D objects.d) Describe the application and constraints of common manufacturing processes and identify possible manufacturing processes & workflow to produce a designed product assembly in realizing the importance of tolerance.e) Understand the basic concept of schematic capture; produce electronic schematics from scratch or design draft, and prepare a file for printing of PCB layout.f) Fabricate PCB and build electronic assemblies and integrate electronic modules with other electro-mechanical parts.

<p>Subject Synopsis/ Indicative Syllabus</p>	<ol style="list-style-type: none"> 1) <u>Occupational Safety</u>: General duties related to occupational safety. Safe systems of work. Common hazards in workplace and corresponding control 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) <u>Application and Operation of Engineering drawing and CAD</u>: Introduction to engineering drawing and BS8888. Orthographic Projection: Principles of angle projection systems. Sectional views and Dimensioning standards. Technical Sketching: free-hand sketching of orthographic and isometric views; Assembly drawings. Introduction to CAD: pros and cons; need and use; software features of CAD system; interacting with computer in constructing a CAD drawing, 3D Solid Modeling. Documentation: dimensioning and plotting of a CAD drawing. 3) <u>Application and Operation of Common Materials Processing and Manufacturing Processes</u>: Introduction to basic manufacturing processes such as turning, milling, grinding, machining, blanking, forming, fabrication, moulding, assembly & joining, and surface finishing processes of metal or plastic parts. 4) <u>Basic Electronics</u>: 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, PCB fabrication process and photochemical etching. Use of basic electronic tools and equipments. Mounting and installation of electronic circuits, wiring of electronic assemblies, prototype making, electronic circuit trouble shooting techniques and functional tests.
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<p>Learning Methodology</p>	<ol style="list-style-type: none"> 1) The teaching and learning methods include lectures, tutorials, and workshop practice. These are organized in a project-based collaborative integrated learning approach. 2) The lectures/tutorials 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. 3) The 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. 4) Project-based integrated learning approach is applied to facilitate students to learn, practice, apply, and reflect the diverse topics in a coherent and unified manner. Collaborative learning provides opportunity for students to develop generic skills in teamwork and to learn from peers. These are adopted to enhance active and holistic learning to improve learning motivation as well as understanding of relationships among the diverse topics in material processing. 																																																						
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1"> <thead> <tr> <th rowspan="2">Assessment Methods</th> <th rowspan="2">Weighting (%)</th> <th colspan="6">Intended Learning Outcomes Assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> </tr> </thead> <tbody> <tr> <td>1. Industrial Safety - Test - Report</td> <td>10 (5) (5)</td> <td></td> <td>✓ ✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Project - Individual Workshop Performance - Group Performance</td> <td>50 (30) (20)</td> <td>✓ ✓</td> <td></td> <td>✓ ✓</td> <td>✓ ✓</td> <td>✓ ✓</td> <td>✓ ✓</td> </tr> <tr> <td>3. Group Project Presentation</td> <td>15</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>4. Project Report</td> <td>25</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed						a	b	c	d	e	f	1. Industrial Safety - Test - Report	10 (5) (5)		✓ ✓					2. Project - Individual Workshop Performance - Group Performance	50 (30) (20)	✓ ✓		✓ ✓	✓ ✓	✓ ✓	✓ ✓	3. Group Project Presentation	15	✓		✓	✓	✓	✓	4. Project Report	25	✓	✓	✓	✓	✓	✓	Total	100						
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Student Study Effort Expected	Class Contact	
	▪ Lecture	10 Hrs.
	▪ Practical Training supplemented with Briefing	135 Hrs.
	Other Study Effort	
	▪ Self Study	30 Hrs.
	▪ Report Writing	30 Hrs.
	Total Study Effort	205 Hrs.
Reading List and References	<p>1) Materials and processes in manufacturing, by E. Paul Degarmo, Macmillan Publishing Co., Inc., New York.</p> <p>2) Special reading materials prepared by the Industrial Centre and the Rehabilitation Engineering Centre.</p> <p>3) OESS, InfoShare, http://www.ic.polyu.edu.hk/oess/POSH/Student.htm, Industrial Centre of The Hong Kong Polytechnic University.</p>	