Subject Description Form

Subject Code	EIE2902/IC2115
Subject Title	Industrial Centre Training for EIE
Credit Value	3 training credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objective of this subject is to equip students with knowledge and skills through technical training that are fundamental and essential in their study and professional practice in electronic and information engineering (EIE).
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. explain legal duties related to occupational safety, identify common workplace health and safety hazards, corresponding control measures and apply personal protection equipment; 2. design electronic circuit on printed wiring board with EDA tool; 3. fabricate prototype electronic circuit on printed wiring board for experimentation, demonstration and development purposes; 4. explain pragmatic electronic manufacturing processes, circuit interconnects and assembly methods for electronic product or equipment, specify basic industrial process for mass production and fabricate simple prototype for test and investigation; 5. design and programme simple embedded systems; 6. recognize training as an important part for a professional engineering career and the needs for multi-disciplinary training and continual professional development in professional engineering practice.
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** This subject contributes to programme outcomes 1, 5, 7 and 9 through practical training in electronic and information engineering. <u>Category A: Professional/academic knowledge and skills</u> • Programme Outcomes 1 and 5: This subject contributes to the programme outcome through practical training and practice in the design, development, fabrication, testing and troubleshooting of electronic or information equipment and products with hardware and software tools. <u>Category B: Attributes for all-roundedness</u> • Programme Outcome 7 and 9: This subject contributes to the programme outcome through induction, practical training and industrial safety teaching with practical training in a recognized professional engineer training centre. Through this subject and subsequent professional training, student will be aware of and recognize the importance of training, life-long learning, professional responsibility and ethics that are demanded by the society.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. <u>Industrial Safety Overview (15 hours)</u>

	1.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 1.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations. 1.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 1.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment. 2. <u>Electronic Circuit Design Practice (18 hours)</u> 2.1. Introduction to electronic design automation (EDA) software; circuit schematics capture and representation; placement of components, capturing, annotation, labelling, net list. Electronic parts library, symbols, decals, physical packages, discrete components, integrated circuits, logic and analogue circuits, electronic parts creation and application. 2.2. Printed Circuit Board (PCB) design, hands on practice on PCB circuit design with EDA tools. 2.3. Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical & electronic device symbols and layout, Circuit artwork, etching process, prototype PCB fabrication. 3. <u>Electronic Workshop Practice for EIE (30 hours)</u> 3.1. Introduction to common electronics parts, use of basic test instruments, best practice and basic troubleshooting techniques, electronic workshop safety. 3.2. Introduction to electronic assembly design and manufacturing process, components, tools and machines. 3.3. Introduction to electronic circuit interconnect technologies: Surface Mounted Technology (SMT), Chip-on-board (COB) and wave-soldering. 3.4. Introduction to advanced electronic packaging and assembly process: fine-pitch SMT, Ball Grid Array (BGA), Flip-chip and Chip Scale Package (CSP). 3.5. Soldering and de-soldering techniques, mounting and installation of electronic circuits, wiring of subassemblies. 3.6. Hands-on practice on reflow soldering, SMT process, chip level wire bonding, chip-on-board encapsulation, LCD display attachment with heat-seal connector. 3.7. Soldering quality of BGA assembly and X-ray inspection machine. 4. <u>Embedded System Application and Practice (27 hours)</u> 4.1. Introduction to Microchip Microcomputer families and development tools. 4.2. Hands-on practice on memory, I/O, data communications, ADC operations. 4.3. Hands-on practice on LED and LCD displays. 4.4. Hands-on practice on motor control and sensors. 4.5. Application of Microcomputer on consumer electronic products, mechatronics, home automation products, wired and wireless connectivity.

	Training Schedule: 3 hours per week in Year 1 semester 1 to semester 3 or semester 1 to semester 2 and 6 hours in semester break.
Teaching/ Learning Methodology	The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures aim at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials aim at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.

Alignment of Assessment and Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**					
		1	**2**	**3**	**4**	**5**	**6**
Continuous Assessment							
• Assignment / Project	30%	✓	✓	✓	✓	✓	
• Tests	30%	✓	✓	✓	✓	✓	
• Others (Reports & Logbook)	40%	✓	✓	✓	✓	✓	✓
Total	100%						

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

Specific Assessment Methods/ Task	**Remarks**
Assignment / Project	The projects are designed to facilitate students to reflect and apply the knowledge periodically throughout the training.
Tests	Tests are designed to facilitate students to review the breadth and depth of their understanding on specific topics.
Others (Reports & Logbook)	Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.

Student Study Effort Expected

Class contact (Time-tabled)	
• Lecture/Tutorial	20 Hours
• Workshop	70 Hours
Other student study effort	0 Hour
Total student study effort	90 Hours

Reading List and References	**Reference Software List:** 1. PADS from Mentor Graphics Inc. 2. MPLAB from Microchip Corp. **Reference Standards and Handbooks:** 1. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams 2. IEC 61082 Preparation of Documents used in Electrotechnology 3. IPC-D-279-1996, Design Guidelines for Reliable Surface Mount Technology Printed Board Assemblies, IPC. 4. IPC-J-STD-001F-2014, Requirements for Soldered Electrical and Electronic Assemblies, IPC. 5. IPC-A-610F-2014, Acceptability of Electronic Assemblies, IPC. **Reference Books:** 1. R.S. Villanucci, A.W. Avtgis, W.F. Megow, Electronic Techniques: Shop Practices and Construction, 7th ed., Practice-Hall, 2002. 2. Training material, manual and articles published by Industrial Centre
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