Subject Description Form

Subject Code	EIE2102 (for 42470 and 42375)
Subject Title	Basic Electronics
Credit Value	3
Level	2
Pre-requisite	For 42470: EIE2100 Basic Circuit Analysis For 42375: EIE2101 Basic Circuit Analysis /EIE2110 Basic Circuit Analysis and Electronics
Co-requisite/ Exclusion	Nil
Objectives	To introduce the operating principles of electronic circuits. Several classes of electronic circuits will be covered in this subject – diode circuits, BJT transistor circuits, FET transistor circuits. An introduction to power amplifiers will also be given.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Acquire some understanding in the fundamental electric and electronics principles. 2. Solve basic problems in electric and electronic circuits. 3. Acquire better skills in performing the laboratory experiments. Category B: Attributes for all-roundedness 4. Perform independent learning in basic electric and electronic principles. 5. Work as a team in laboratory sessions.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Load Line Analysis and Diode Circuits I-V characteristics of diodes and general nonlinear components. DC solution based on load line construction. Practical diode circuits: rectifier circuits, clipping and clamping circuits. 2. Transistors and Biasing Circuits The bipolar junction transistors (BJT). DC biasing and analysis of BJT circuits. Metal-oxide-semiconductor field-effect transistor (MOSFET). DC biasing and analysis of MOSFET circuits. Load line and graphical large-signal analysis. Transistor amplification concept. 3. Transistor Amplifiers and Small-signal Concepts Basic BJT and MOSFET amplifier configurations: common emitter and common source configurations. Small-signal models and parameters with reference to two-port networks. Concept of transconductance. Voltage gain. Input and output impedances. Introduction to loading effect. 4. Introduction to Frequency Domain Analysis Transfer functions from ac circuits in terms of $j\omega$. Introduction to frequency domain, from $j\omega$ to s. General s-domain transfer functions. Simple first-order filter circuits. Introducing concepts of pole, corner frequency, bandwidth. For sinusoidal driving sources, use of $j\omega$ axis for magnitude and phase plots. Extension to asymptotic plots and hence Bode plots.

5. Fundamentals of Power Amplifiers
   Concept of conversion efficiency. Class A, Class B & Class AB operations of power amplifiers and the related circuits.

Laboratory Experiments:

1. DC transistor biasing/load line and diode clamping circuits.
2. Transistor amplifier circuits.
3. Design of a simple transistor amplifier.
4. OCL class AB power amplifier.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures, supplemented with interactive questions and answers	1, 2, 4	In lectures, students are introduced to the *knowledge* of the subject, and *comprehension* is strengthened with interactive Q&A.
Tutorials, where problems are discussed and are given to students for them to solve	1, 2, 4	In tutorials, students *apply* what they have learnt in solving the problems given by the tutor.
Laboratory sessions, where students will perform experimental verifications. They will have to record results and write a report on one of the experiments.	2, 3, 5	Students *acquire* hands-on experience in using electronic equipment and *apply* what they have learnt in lectures/tutorials to experimentally validate the theoretical investigations.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment Mid-semester test End-of-semester test Lab	 12% 12% 16%	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓		✓	
Total	100%					

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<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

<table>
<tr><th>Specific Assessment Methods/Tasks</th><th>Remark</th></tr>
<tr><td>Laboratory works and reports</td><td>Students will be required to perform two experiments and submit a report on one of the experiments.</td></tr>
<tr><td>Mid-semester test</td><td>There will be a mid-semester test to evaluate students' achievement of all the learning outcomes and give feedback to them for prompt improvement.</td></tr>
<tr><td>End-of-semester test and Examination</td><td>There will be an end-of-semester test and examination to assess students' achievement of all the learning outcomes. These are mainly summative in nature.</td></tr>
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<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Textbook:
1. G. Rizzoni, Fundamentals of Electrical Engineering, 1st ed., McGraw-Hill, 2009.

References:
1. D.A. Neamen, Micoelectronics:Circuit Analysis and Design, Boston: McGraw-Hill, 3rd ed., 2007.
2. A.H. Robbins and W.C. Miller, Circuit Analysis: Theory and Practice, Thomson Learning, 4th ed., 2006.</td></tr>
<tr><td>Last Updated</td><td colspan="2">June 2021</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr W. Y. Tam</td></tr>
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