Subject Description Form

Subject Code	EIE2110
Subject Title	Basic Circuit Analysis and Electronics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. Introduce fundamental circuit theory. 2. Develop ability for solving problems involving electric circuits. 3. Develop skills for experimentation on electric circuits. 4. Impart relevant skills and knowledge for independent learning of other subjects that require such skills and knowledge.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Acquire a good understanding of fundamental circuit theory and electronics. 2. Solve simple problems in electric circuits. 3. Use suitable instrumentation to carry out experimental investigations to validate the theoretical investigations. Category B: Attributes for all-roundedness 4. Search for useful information in solving problems in electric circuits.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. DC Circuits Introduction to electric circuits. Kirchhoff's current and voltage laws. Independent and dependent sources. Simple circuits: voltage divider, current divider, series and parallel circuits. Nodal and mesh analysis. Thévenin and Norton theorems. Maximum power transfer. 2. Capacitance, Inductance and First Order Transient Constitutive relations of capacitor and inductor. Introduction to time-varying circuits. Time-domain solution of simple RC and LC circuits. 3. Introduction to Transformers Concept of ideal transformer. Dot convention. Applications in galvanic isolation and voltage/current level conversion. 4. Steady-state Analysis of AC Circuits Average and rms values. Steady-state analysis of circuits driven by single frequency sinusoidal sources. Real and reactive powers. Power factor. 5. Load Line Analysis and Diode Circuits I-V characteristics of diodes. Practical diode circuits. 6. Transistor Amplifiers The bipolar junction transistors (BJT). DC biasing and analysis of BJT circuits. Basic BJT amplifier configurations. 7. Operational Amplifiers Ideal operational amplifier. Op-amp circuits: inverting amplifier, non-inverting amplifier, summer, difference amplifier, integrator and differentiator.

Laboratory Experiments:

1. Introduction to laboratory instrumentation / Thévenin and Norton theorems
2. First order transient

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.
Practice classes, where problems are discussed and are given to students for them to solve	1, 2, 4	In practice classes, 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, 4	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 Subject Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)			
		1	2	3	4
1. Continuous Assessment (Total 40%)					
• Laboratory works	14%		✓	✓	✓
• Laboratory reports	6%		✓	✓	✓
• Mid-semester test	10%	✓	✓		✓
• End-of-semester test	10%	✓	✓		✓
2. Examination	60%	✓	✓		✓
Total	100%				

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

Specific Assessment Methods/Tasks	Remark
Laboratory works and reports	Students will be required to perform two experiments and submit a report on one of the experiments. The assessment can measure the practical skills and theoretical knowledge of students.
Mid-semester test	There will be a mid-semester test to evaluate students' achievement of topics learned in the first six weeks and give feedback to them for prompt improvement.
End-of-semester test and Examination	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.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Textbook:

1. W.H. Hayt, J.E. Kemmerly and S.M. Durbin, *Engineering Circuit Analysis,* 9th ed., New York: McGraw-Hill, 2019.
2. G. Rizzoni, *Fundamentals of Electrical Engineering*, 1st ed., McGraw-Hill, 2009.

References:

1. C.K. Tse, *Linear Circuit Analysis,* London: Addison-Wesley, 1998.
2. D.A. Neamen, *Microelectronics: Circuit Analysis and Design*, Boston: McGraw-Hill, 3th ed., 2010.
3. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 5th ed., 2013.

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