Subject Description Form

Subject Code	EIE2101
Subject Title	Basic Circuit Analysis
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. 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 analyses. Thévenin and Norton theorems. Power dissipation. Source loading and maximum power transfer. 2. Capacitance, Inductance and First Order Transient Constitutive relations of capacitor and inductor. Introduction to time-varying circuits. Time-domain solution and transient behaviour 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. Phasors (rotating vectors). Steady-state analysis of circuits driven by single fixed frequency sinusoidal sources. Impedance and admittance. Systematic complex number analysis, i.e., same treatment as DC circuits but with complex numbers representing phase and magnitude of AC voltages and currents. Real and reactive powers. Power factor. 5. Diode Circuits Current-voltage characteristics of p-n junction diode. Practical diode circuits. 6. Amplifiers Ideal operational amplifier. Defining characteristics (i.e., infinite gain and infinite input resistance). Op-amp circuits: inverting amplifier, non-inverting amplifier, summer, difference amplifier, integrator and differentiator. DC

biasing of bipolar junction transistors (BJT). Basic BJT amplifier configurations.

Laboratory Experiments:

1. Introduction to laboratory instrumentation / Thévenin and Norton theorems
2. First order transient
3. Use of operational amplifiers.

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.
Assignments	1, 2, 3, 4	Through working assignments, students will develop a firm understanding and *comprehension* of the *knowledge* taught.

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 and reports	16%		✓	✓	✓
• Laboratory reports	4%		✓	✓	✓
• 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
Assignments	Assignments are given to students to assess their competence level of *knowledge* and *comprehension*. The criteria (i.e. *what* to be demonstrated) and level (i.e. the *extent*) of achievement will be graded according to six levels: (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to the students before an assignment is given. Feedback about their performance will be given promptly to students to help them improvement their learning.
Laboratory works and reports	Students will be required to perform three experiments and submit a report on one of the experiments. Expectation and grading criteria will be given as in the case of assignments.
Mid-semester test	There will be a mid-semester test to evaluate students' achievement of all the learning outcomes and give feedback to them for prompt improvement. Expectation and grading criteria will be given as in the case of assignments.
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. Expectation and grading criteria will be given as in the case of assignments.

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,* 7th ed., New York: McGraw-Hill, 2006.
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, *Micoelectronics:Circuit Analysis and Design*, Boston: McGraw-Hill, 3rd ed., 2007.
3. R.A. DeCarlo and P.M. Lin, *Linear Circuit Analysis*, 2nd ed., OxfordUniversity Press, 2001.
4. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 4th ed., 2006.

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