Subject Description Form

Subject Code	BME21120
Subject Title	**Fundamentals of Biomedical Instrumentation I**
Credit Value	3
Level	2
Co-Requisite	AMA2511 Applied Mathematics I
Objectives	This course aims to provide the students appropriate fundamental knowledge in understanding and analyzing electronic circuits and systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate understanding of the I–V characteristics of passive components including resistors, capacitors, and inductors and active current sources and voltage sources; b. Capable of analyzing electric circuit and system containing resistors, capacitors, and inductors for transient and steady-state response; c. Explain the input and output characteristics of operational amplifier; d. Use DC power supplier, function generator, and oscilloscope in the circuit design and analysis.
Contribution to Programme Outcomes (Refer to Part I Section 10)	▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach and Practice) ▪ Programme Outcome 2: Demonstrate an ability to design and conduct BME experiments, as well as to analyze and interpret data. (Teach and Practice) ▪ Programme Outcome 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice. (Teach and Practice) ▪ Programme Outcome 9: Demonstrate an ability to function in multi-disciplinary teams. (Practice) ▪ Programme Outcome 11: Demonstrate an ability to communicate effectively and advise clients, professional colleagues, and other members of the community. (Practice)
Subject Synopsis/ Indicative Syllabus	▪ Electric circuit variables and circuit elements. ▪ Resistive circuits analysis methods and theorems: Node voltage and mesh current methods for resistive circuit analysis; source transformation; superposition; Thevenin's and Norton's theorems.

	▪ Operational amplifier: Ideal operational amplifier conditions; resistive circuit analysis with operational amplifier.		
	▪ Energy storage elements: Capacitor and inductor; I–V characteristics of capacitor and inductor; energy storage in capacitor and inductor.		
	▪ Complete response of RL and RC circuits: Circuit analysis with energy storage elements; first order circuit; transient response analysis; initial condition and steady-state conditions.		
	▪ Sinusoidal steady-state analysis and filters: Sinusoidal source; steady-state response of RL and RC circuit; complex exponential forcing function; phasor; impedance.		
Teaching and Learning Methodology	Lectures will teach fundamentals and applications of circuits and systems illustrated with ample examples in biomedical engineering. Three hands-on laboratory sessions provide students with practical experiences in constructing circuits and systems using real components, and measuring their performance using common electronic test and measurement equipment.		

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)							
		a	b	c	d				
Homework assignments and mid-term exam	30%	√	√	√					
Lab performance and lab report	20%	√	√	√	√				
Final exam	50%	√	√	√					
Total	100%								

Note: To pass this subject, students must obtain grade D or above in both continuous assessment and final examination.

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

The assignments and exams are used to assess the degree that the students understand the knowledge and ability to apply the knowledge to solve problems.

The lab sessions focus on testing the student on how much practical experience they gain and apply knowledge to solve real questions.

Student Study Effort Expected	Class contact:	
	▪ Lectures	30 Hrs.
	▪ Lab experiments	9 Hrs.
	Other student study effort:	
	▪ Self-study	72 Hrs.
	▪ Assignment and lab report	15 Hrs.
	Total student study effort	126 Hrs.
Reading List and References	▪ Svoboda JA and Dorf RC. Introduction to Electric Circuits, 9th Ed. Wiley & Sons, 2014.	
Date of Last Major Revision	14 July 2014	
Date of Last Minor Revision	27 Aug 2015	