Module Type		Taught		
Level		4	Credit Value	20
Programme(s) in which module is available		BEng: Electrical and Electronic Engineering; Communication Engineering		
Involvement of Other Schools		None		
Resource Split		N/A		
Name of Module Co-ordinator		Prof Lin Zhang		
Related Modules	Pre-requisites	None; students are expected to have a knowledge of A-level standard Mathematics and a scientific background.		
	Co-requisites	None		
	Prohibited Combinations	None		
Minimum and Maximum Intake Sizes		None		

Aims of the Module

To provide a broad introduction of fundamental concepts, principles and analysis techniques of electrical engineering to enable higher level study in the subject. The module will concentrate on:

- the fundamentals of electrical DC and AC circuits.
- a basic understanding of electrostatics, magnetostatics and electromagnetics.
- an introduction to waves and wave motion with emphasis on optical waves.

with particular application to electrical and electronic engineering.

Summary of Content

Electrical DC and AC circuits. Basic electric field theory and electricity. Fundamentals of DC circuit analysis. Network theorems.

- Capacitance and inductance. Time-dependent response of R-C, R-L and R-L-C circuits.
- Computer simulation. PSPICE for circuit analysis
- Fundamentals of AC circuits. Application of phasors.
- Series and parallel AC circuits and networks. Filters and resonant circuits
- Electrical power

Concepts of electrostatics: Coulomb's law; electric field E and potential V due to point and distributed charge systems.

- Introduction to Gauss's Theorem, electric displacement D, E and V due to charged conductors.
- Capacitance revisited: capacitive systems, dielectric media, polarisation and susceptibility.

Concepts of electromagnetics: Biot-Savart Law; permeability of free space, magnetic induction B.

- Introduction to Ampere's Circuital Law; B due to straight wires, short coils and solenoids.
- Faraday-Lenz Laws; induced emf due to a rotating current loop, principles of dynamos and alternators, inductance in simple coil systems.
- Electromagetic forces; moving coil galvanometer and electric motor, behaviour of charged particle beams, cathode ray tube.

Introduction to waves: Progressive waves and standing waves; longitudinal and transverse waves. Overview of mathematical notation.

- Phase and group velocities, dispersion.
- Introduction to the concepts of superposition, coherence. Interference between waves; diffraction.
- Polarisation.

Summary of Methods and Frequency of Teaching

Contact hours spread over teaching periods 1 and 2: Lectures: 24 hour**;** Tutorials: 12 hour; Laboratory: 12 x 3 hours; Private study: 128 hours

Summary of Methods of Assessment and Feedback (including formative feedback)

The module will be assessed by exam (50%) and continuous assessment, comprising laboratory reports (20%), design case studies, class tests and coursework (30%). Feedback will be provided according to School guidelines. 1-to-1 feedback will be provided orally in the laboratory, in presentations and demonstrations, and by written comments on written reports. Generic feedback will be provided orally in class and via Blackboard.

Module Outcomes – what the student should gain from successful completion of the module:	Learning and Teaching and Assessment Strategies to enable outcomes to be achieved and demonstrated	
	Learning and Teaching Methods	Assessment Methods
Knowledge and Understanding of • The basics of mathematics and science underpinning electrical circuits. • The fundamental concepts of electrostatics, electromagnetics and waves. • The fundamental principles of circuit theory. • Design techniques appropriate to circuit theory. • The use of test and measurement equipment for circuit characteristics.	Lectures, recommended reading, laboratory exercises, and case studies	Examination, class test, laboratory reports, case studies
Intellectual Skills • Ability to analyse and design appropriate experiments. • Ability to evaluate relevant information from a variety of sources. • Ability to evaluate and interpret experimental measurements. • Problem solving involving circuits, and fields and waves.	Lectures, laboratory exercises, case studies, tutorial problems, recommended reading	Examination, class test and laboratory reports, case studies
Professional/Subject Specific Skills • Ability to plan and carry out experiments using appropriate methods and techniques.	Lectures, laboratory exercises, case studies, tutorial problems	Examination, class test, laboratory reports, case studies
Transferable Skills • Enhanced information gathering skills for the physical sciences • Management of time and resources • Self-study and independent learning skills	Lectures, laboratory exercises, tutorial problems	Laboratory reports, case studies

Introductory Learning Resources	Module information, tutorial material and generic feedback will be available on Blackboard
Core Texts, Reading Lists	"Introductory Circuit Analysis", 9/e and10/e, 11/e, Robert L. Boylestad, Prentice-Hall "Electric Circuits", 2/e, Theodore F. Bogart, McGraw-Hill, 1992 "Electric Circuits Fundamentals", 7/e, Thomas L. Floyd, Pearson Prentice Hall, 2006 "Introduction to Electric Circuits", 5/e and 6/e, Richard C. Dorf and James A. Svoboda, Wiley, 2001 "Electric Circuits", 6/e, James W. Nilsson and Susan A. Riedel, Prentice-Hall, 2000 "Basic Engineering Circuit Analysis", 6/e, J. David Irwin and Chwan-Hwa Wu, Wiley, 1999 "Electric Circuit analysis", 3/e, David E. Johnson, Johnny R. Johnson, John L. Hilburn and Peter D. Scott, Wiley, 1999 "Introduction to Electrodynamics", 3/e, David. J. Griffiths, Prentice Hall, 2003, ISBN 0-13-919960-8 "Engineering Electromagnetics", 6/e, William H. Hayt, Jr. , John A. Buck, McGraw Hill, 2001, ISBN 0-07-120229-3 "Optics", 4/e, Eugene Hecht, Addison Wesley Longman, 2002, ISBN 0-8053-8566-5 "Worked Problems in Optics", Alan H. Tunnacliffe, MI Associates, 2000, ISBN 0-900099-16-17 "Modern Optics", Robert Guenther, John Wiley & Sons, 1990

Specification completed by:	Date	Lin Zhang; Geof Carpenter	28.7.09
Date module approved by Teaching Committee(s)		Original version January 2008	