FACULTY OF ENGINEERING
MODULE DESCRIPTION FORM
PH 167 PHYSICAL ELECTRONICS

Module Code: PH167	**Module Title:** Physical Electronics	
Module Registrar: Dr Shashank Virmani		
Other Lecturers Involved: Dr Nigel Langford	**Credit Weighting** 10	**Semester:** 2
Compulsory/optional/elective class: C	**Academic Level:** 1	

Pre-requisites: Higher Physics or equivalent. Basic knowledge of calculus and vectors.

MODULE FORMAT AND DELIVERY (HOURS):

Lectures	Tutorial	Assignments	Laboratories	Private Study	Total
24	12	6		50	92

GENERAL AIMS

This class in an introduction to specific physics topics intended for students from the Department of Electrical and Electronic Engineering. It introduces classical dynamics, electrostatics and magnetism, and also more modern physics concepts of quantisation, energy levels, photons and properties of semiconductors.

SPECIFIC LEARNING OUTCOMES

At the end of the course students will be able to

1. Analyse the motion of bodies travelling in either a straight line or a circle including rotational dynamics
2. State and apply Newton's Law of Gravitation to describe the motion of a satellite around a planet.
3. Apply Gauss's law to distributions of simple electric charges and compute the associated force and field.
4. Determine the magnetic field and force associated with a current flowing in a conductor.
5. Describe the motion of charged particles in electric and magnetic fields.
6. Understand and explain the origin of energy levels in simple models of an atomic system.
7. Extend this understanding to describe the origin of energy bands in materials.
8. Explain the difference between conductors, insulators and semiconductors.
   Explain the operation of simple semiconductor devices

SYLLABUS

Dynamics of linear and rotational motion

- Revision of the mechanics of linear motion
- Angular velocity and acceleration, torque, moment of inertia, kinetic energy of rotation, conservation of angular momentum.
- Gravitation and orbits of satellites. Geostationary satellites.

Electromagnetism

- Electric charge, Coulomb's law and electric field strength. Electrostatic flux and Gauss's law (statement only).
- Potential energy of charges in a field and potential difference.
- Magnetism, magnetic induction, forces on charges moving in magnetic fields and on wires carrying current.
- Torque on current loop and magnetic moment.
- Ampere's law. Magnetic flux.
- Faraday's law of electromagnetic induction. Lenz's law. Inductance and mutual inductance.
- Motion of charges in electric and magnetic fields. Hall effect, mass spectrograph, cyclotron effect, cathode ray tube.

Semiconductor Physics

- Bohr model of hydrogen atom quantisation of angular momentum, energy levels and emission spectrum, Photons and Planck's constant.
- Energy levels and energy bands. Insulators, conductors and semiconductors, doping of semiconductors, properties of doped semiconductor Introduction to physics of semiconductor devices.

Devices:

- Electrostatic: photocopier, laser printer, inkjet printer.
- Semiconductor: p-n junction, bipolar junction transistors, thyristors, field-effect transistor, charge transfer devices.

ASSESSMENT METHOD(S) INCLUDING PERCENTAGE BREAKDOWN AND DURATION OF EXAMS

Examination	**Duration**	2	**Weighting %**	90
Coursework	**Number**	4	**Weighting %**	10

COURSEWORK / SUBMISSIONS DEADLINES:

RESIT ASSESSMENT PROCEDURES: Examination of similar form to 1st diet

ADDITIONAL INFORMATION RELEVANT TO COURSE DELIVERY AND ASSESSMENT

RECOMMENDED READING

A textbook is not required, but problems appropriate to the lectures will be given as handouts. The book University Physics (9th, 10th or 11th edition) by Young & Freedman may be useful supplementary reading

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