UNIVERSITI TEKNOLOGI MARA

COURSE INFORMATION

Confidential

Code	:	PHY407
Course	:	Physics II
Level	:	Degree
Credit Unit	:	3
Contact Hour/SLT	:	F2F-(5hrs-workshop)
Part	:	2
Course Status	:	Core
Prerequisite	:	None
Course Outcomes	:	Upon completion of this course, students will be able to:

1. Explain the concepts, laws and theories in electrostatics, electricity and magnetism using either or a combination of the qualitative, visual and quantitative approach. (LO1-C2)
2. Observe, predict, conduct and discuss results of scientific investigations in areas of electrostatics and electricity. (LO2-P3)
3. Verbally communicate with peers and the facilitator on how to operate instruments and how to conduct authentic and meaningful investigations in areas of electrostatics and electricity. (LO4-CS3)
4. Collaborate with team members in team-related assessment tasks. (LO5-TS3)

Course Description : This course will interactively engage students cognitively and scientifically in areas of electrostatics, electricity, magnetism, atomic physics and modern physics. Students will define concepts, state and explain laws and theories, make predictions as to the possible outcome of an event, perform investigations via simulations and laboratory exercises and verbally and in writing, discuss the results and relationships

with peers and facilitators The designated lecture session is used to discuss results of investigations leading to its relation to the existing laws, principles or theories. Lecture sessions employ a mixture of lectures and active learning (self and peer discussions). The outcomes shall be assessed through a variety of tools which include the traditional paper examination, concept maps, inventories (CSEM), informal interviews and classroom engagement.

Syllabus Content

1.0 Introduction: Diagnostics and Learning Skills
- 1.1 Learning Styles & Views on Science.
- 1.2 Conceptual Survey in Electricity & Magnetism.
- 1.3 Concept Mapping.

2.0 Electrostatics
- 2.1 Charged objects and electric (Coulomb's) force.
- 2.2 Properties of conductors and insulators.
- 2.3 Charging by contact, induction and friction.

Lab 1:
PHET simulation "Balloons & Static Electricity"
Lab Investigation: "Introduction to Static Electricity".

3.0 Electrostatics
- 3.1 Coulomb's Law.
- 3.2 Electric Field.
- 3.3 Electrical field lines.
- 3.4 Electrical field in conductors.

Lab 2:
PHET simulation
- i. "Electric Field Hockey,
- ii. "Vector-Math"
- iii. "Charges and Fields".

Lab Investigation: "Electrical Force & Electrical Field".

4.0 Electric Potential Energy, Electric Potential and Capacitance
- 4.1 Potential energy
- 4.2 Electric potential difference
- 4.3 Electric potential difference created by point charges
- 4.4 Capacitors and dielectrics

4.5 Capacitors in series and parallel
4.6 *RC* circuits
4.7 Charged objects and electric force

Lab 3:
PHET simulation
i. "Electric Field Hockey,
ii. "Charges and Fields".
Lab Investigation: "Introduction to Electric Potential".

5.0 Resistance, Resistivity & Ohm's Law
5.1 Electromotive force and current
5.2 Ohm's law
5.3 Resistance and resistivity
5.4 Electric power
5.5 Series and parallel wiring
5.6 Circuits wired partially in series and partially in parallel

Lab 4:
Lab Investigation: "Capacitors, Capacitance, Series & Parallel Circuit".

6.0 Electric Circuits & Kirchoff's Laws
6.1 internal resistance
6.2 Kirchhoff's laws
6.3 the measurement of current and voltage

Lab 5:
PHET simulation: "Circuit Construction Kit (DC Only)"
Lab Investigation: "Batteries & Bulbs: Voltage, Current & Resistance".

7.0 Magnetic Field & Magnetic Forces
7.1 Magnetic field lines of permanent magnets.
7.2 Magnetic force that a magnetic field exerts on moving charges.
7.3 Motion of a charged particle in a magnetic field.
7.4 Motion of charges in magnetic & electric fields.
7.5 Mass spectrometer & velocity selectors.
7.6 Force on a current-carrying conductor in a magnetic field.

Lab 6:
PHET simulation: “Circuit Construction Kit (DC Only)”
Lab Investigation: “Resistance, Ohm’s Law & Kirchoff’s Law”.

8.0 Magnetic force on current-carrying conductors & magnetic field produced by current-carrying conductors
- 8.1 Torque on a current-carrying coil.
- 8.2 Electric motors.
- 8.3 Magnetic fields infinitely long wire.
- 8.4 Magnetic field produced at the centre of circular wires.
- 8.5 Magnetic field of solenoids.
- 8.6 Force between current-carrying wires.

Lab 7:
PHET simulation: “Faraday’s Electromagnetic Lab”
Lab Investigation: “Magnetic Field & Magnetic Force on Electric Charges”.

9.0 Electromagnetic Induction
- 9.1 Magnetic flux
- 9.2 Faraday’s Law of electromagnetic induction
- 9.3 Motional emf
- 9.4 Lenz’s Law of electromagnetic Induction

10.0 Electric Generators, Inductors and Transformers
- 10.1 Induced current in coils moving in magnetic field.
- 10.2 Electric generators.
- 10.3 Self and Mutual Inductance
- 10.4 Transformers.

11.0 Modern Physics
- 11.1 Properties of particles & properties of waves.
- 11.2 Wave-particle duality.
- 11.3 Blackbody radiation and the quantization of light.
- 11.4 Particle property of light & the Photoelectric effect.
- 11.5 the De Broglie wavelength & the wave nature of matter.
- 11.6 Heisenberg Uncertainty Principle.

12.0 The Nature of Atom

12.1 Rutherford scattering and the nuclear atom.
12.2 Observed line spectra of atomic transitions.
12.3 Bohr atomic model of the hydrogen atom.
12.4 Quantum mechanical picture of the hydrogen atom.
12.5 X-rays production and spectrum analysis.

Instructional Strategy:		Predict → Observe → Do → Synthesize (PODS) Cycle
Active Learning Instructional Methods: Workshop, interactive lecture, labs and Cooperative group	:	i. Scientific investigation via simulations and laboratories experiences. ii. Active engagement via lecture-discussion & cooperative group discussion. iii. Critical assessment of findings. iv. Synthesising of results with existing laws, theories and principles.
Assessment	:	Course Work: 80% Cognitive 40% ▪ Concept Map 4% ▪ Three tests 3x10%=30% ▪ Three quizzes 3x2%=6% Practical Skills 25% ▪ Pre-lab quiz 5x1%=5% ▪ Manipulative skills 5% ▪ Procedural skills 5% ▪ Lab reports 2x5%=10% Communication Skills 10% ▪ Class dialogues 5% ▪ Lab dialogues 5% Team work 3% Ethics 2% Final exam 20%
Recommended Text (if any)	:	Physics by Cutnell & Johnson 7th edition (algebra based); John Wiley &Sons, Inc.
References	:	Fundamental of Physics by Halliday, Resnick, Walker;6th or 7th Ed., John Wiley &Sons, Inc.

COURSE OUTCOMES

COURSE CODE	**PHY407**	CENTRE OF STUDY	**FACULTY OF APPLIED SCIENCES**
COURSE NAME	**PHYSICS II**	PREPARED BY	**ASSOC .PROF. DR. JAAFAR JANTAN**
CREDIT HOURS	**3**	DATE	**15th MAY 2009**

COURSE OUTCOMES	**PROGRAMME OUTCOMES**											**Teaching & Learning Activities**	**Assessment Tasks**
	LO1 PO1	LO2 PO2	LO2 PO3	LO3 PO4	LO4 PO5	LO4 PO6	LO5 PO7	LO6 PO8	LO7 PO9	LO8 PO10	LO9 PO11		
1. Explain the concepts, laws and theories in electrostatics, electricity and magnetism using either or a combination of the qualitative, visual and quantitative approach. (LO1-C2	3											a. Independent Learning (pre-class reading b. Lecture-discussion c. Simulations d. Active learning (self & peer dialogue) e. Modelling	▪ CSEM ▪ Exam (Quiz, Test, finals) ▪ Concept Maps
2. Observe, predict, conduct and discuss results of scientific		3	3									a. Independent Learning (pre-class reading	▪ Pre lab Quiz ▪ Lab Portfolio ▪ Viva

COURSE OUTCOMES	PROGRAMME OUTCOMES											Teaching & Learning Activities	Assessment Tasks
	LO 1 PO 1	LO 2 PO 2	LO 2 PO 3	LO 3 PO 4	LO 4 PO 5	LO 4 PO 6	LO 5 PO 7	LO 6 PO 8	LO 7 PO 9	LO 8 PO 10	LO 9 PO 11		
investigations in areas of electrostatics and electricity. (LO2-P3)												b. Active learning (self & peer dialogue) c. Simulations d. Lab investigations	
3. Verbally communicate with peers and the facilitator on how to operate instruments and how to conduct authentic and meaningful investigations in areas of electrostatics and electricity. (LO4-CS3)					3							a. Active learning (self & peer dialogue b. Lab demonstration c. Lab investigations d. Cooperative Group Discussion	▪ Viva ▪ Oral interview ▪ Visual Observation
4. Collaborate with team members in team-related assessment tasks. (LO5-TS3)							3					e. Active learning (self & peer dialogue) in lab & classroom f. Discussion	▪ Visual Observation ▪ Self & peer assessment

Rating of CO addressing PO:

1 - Compliance Not Measurable (Slightly)
2 – Compliance without assessment (Moderately)
3 – Compliance and measurable (Substantially)

Program Outcomes:

PO1 (LO1)	Able to analyze problems by applying knowledge and understanding of laws, theories and principles of science and mathematics.
PO2 (LO2)	Able to safely prepare sample, operate and use laboratory equipments.
PO3 (LO2, LO3)	Able to identify problems, design an experiment, process, interpret and analyze experimental data.
PO4 (LO3)	Able to apply the scientific reasoning in solving authentic problems.
PO5 (LO4)	Able to verbally express and articulate scientific ideas effectively.
PO6 (LO4)	Able to express and articulate scientific ideas in written form.
PO7 (LO5)	Able to effectively work in a multidisciplinary team.
PO8 (LO6)	Able to apply values, ethics, morality and professionalism in their scientific pursuit.
PO9 (LO7)	Able to manage information and engage in life-long learning.
PO10 (LO8)	Able to apply managerial and entrepreneurial skills.
PO11 (LO9)	Able to demonstrate leadership skills.