UNITED INTERNATIONAL UNIVERSITY

Department of Computer Science and Engineering (CSE)

Course Syllabus

1	**Course Title**	Physics
2	**Course Code**	PHY 2105
3	**Trimester and Year**	Summer 2024
4	**Pre-requisites**	Fundamental Physics
5	**Credit Hours**	3
6	**Section**	C
7	**Class Hours**	
8	**Class Room**	601
9	**Instructor's Name**	Sagar Dutta
10	**Email**	sagar@ins.uiu.ac.bd
11	**Office**	Room# 619(D)
12	**Counseling Hours**	Separately included
13	**Text Book**	**1. Fundamentals of Physics-D. Halliday, R. Resnick & J. Walker (10th Ed.)** 2. Physics for Engineers - Giasuddin Ahmad (Part-1 & 2) 3. Concept of Modern Physics - Arthur Beiser (6th Ed.)
14	**Reference**	1. Physics Vol. I - Halliday, Resnick & Krane 2. Vibrations and Waves - A. P. French 3. Atomic Physics By S. N Ghoshal 4. Waves and Oscillations - N. Subramanyam & Brij Lal (2nd Ed.) 5. University Physics - Sears, Zemansky, Young & Freedman (12th Ed.) 6. Atomic and Nuclear Physics – N. Subrahmanyam & Brij Lal.
15	**Course Contents (approved by UGC)**	
16	**Course Outcomes (COs)**	**1.** Define, Explain, and Show examples of SHM, DHM, FHM; Lissajou's figure; EM wave, Group velocity, Phase velocity, Standing waves, Node and antinode. The Doppler effects; Charge, State Coulomb's law, Electric dipole; State Gauss's law, Electric flux, Flux density; Current and current density, Resistance and Resistivity, State Ohm's law, EMF, Power; Magnetic field, Magnetic flux and flux density, State Lorentz Force, State Biot-Savart Law, State Ampere's law; Capacitors, Electron volt, Dielectric media, Polarization vector & displacement vector; Photo-electric Effect, work function, threshold frequency, threshold voltage, Compton Effect, X-rays production, Bragg Diffraction, De Broglie wave length, Heisenberg' s Uncertainty Principle, Correspondence principle, Pair production, Pair annihilation, Expectation value, Quantum Operator, Tunneling effect, Quantum numbers.

		2. Derive, Design, and Find out the differential equation of SHM, DHM, FHM; K.E, P.E. and total energy in SHM; Electric potential and Electric potential energy due to a point charge, dipole, and continuous charge distribution, Electric field calculation from electric potential, Potential gradient, Equivalent capacitance and resistance in series and parallel circuits, Capacitance and stored energy in capacitors for various geometrical orientations; Einstein's photo-electric equation; Compton and De-Broglie wavelength; Braggs law; Bohr radius; total energy, velocity, K.E. of electron. **3.** Calculate, Evaluate, and Solve the time period, frequency, V_{max}, V_{min}, a_{max}, a_{min} of SHM; Equivalent capacitance and resistance in series and parallel circuits, Equivalent capacitance and resistance in series and parallel circuits, KVL and KCL for circuits; threshold frequency, stopping voltage of photoelectric effect, wavelength from Bohr postulate and Braggs plane.
17	**Teaching Methods**	Lecture, Case Studies, Project Developments.
18	**CO with Assessment Methods**	

CO	Assessment Method	(%)
-	Attendance	5
1,3	Assignments	5
1,2,3	Class Tests	20
1,2,3	Midterm exam	30
1,2,3	Final exam	40

19 **Mapping of COs and Program outcomes**

COs	Program Outcomes(POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	Yes											
CO2		Yes										
CO3	Yes											

20 **Lecture Outline**

Class	Topics/Assignments	CLOs	Reading Reference	Activities
1,2	Differential Equation of Simple Harmonic Oscillator, Total Energy calculation and Average Energy of kinetic and potential over different time, Graphical representation of SHM, Variation of position, velocity, acceleration with time, quantitative and qualitative rations between given values and variables associated with objects in oscillatory motion, calculation of maximum and minimum velocity and acceleration, time period and frequency	1,2,3	Text-1 Ref.-1,7	Lecture, Mathematical Problem solving, Q/A
3	Combination of Simple Harmonic Oscillations: Lissajous Figures, time period of simple physical pendulum, Spring Mass System.	1,3	Text-1 Ref.-1,5,7	Lecture, Problem solving, Q/A,

					Assignment
	4,5	Damped Oscillation, Differential equation of DHM, Determination of Damping Coefficient, Difference between solutions of SHM and DHM, Differential equations for Spring mass system with damping mechanism and RLC circuit, Characteristics of damping circuit, Reactance, Impedance, graphical representation of amplitude and frequency vs. time for different DHM	1,2	Text-1 Ref.-1,5,7	**Quiz-1,** Lecture, Assignment , Problem solving, Q/A
	6	Forced Oscillation, Differential equation of FHM, Compare solutions of SHM, DHM and FHM, Resonance, Resonance condition and evaluation of Q factor, Resonance frequency, Two-body Oscillation, Reduce Mass	1,2,3	Text-1 Ref.-1,5,7	Lecture, Problem solving, Q/A
	7	Differential Equation of Progressive Wave, types of waves, equation of traveling wave, relations between frequency, wave length and time period, Power and Intensity of Wave Motion, analysis of power and intensity both quantitative and qualitatively, Stationary Wave	2,3	Text-1 Ref.-1,4,7,8	Lecture, Problem solving, Q/A, Assignment
	8	Group velocity and Phase Velocity, Relation between wave number, and phase velocity or group velocity, Formation of standing waves and equation of standing wave, node, antinode, Fundamental mode, calculation of node and antinode positions for different waves	1,3	Text-1 Ref.-1,5,7	Lecture, Problem solving, Q/A
	9,10	Electricity magnetism: Concept of charge, Coulomb's law, Concept of electric field and its calculation, Electric dipole; Gauss's law in electrostatic and its application, Electric field due to dipole, Torque on a dipole in uniform E-field, Electric flux, Flux density, Gauss's law and Coulomb's law.	1,3	Text-1 Ref.-1,5,7	**Quiz-2,** Lecture, Assignment , Problem solving, Q/A
	10,11	Electric potential and its calculation, Electric potential energy, Relationship between Field and Potential, Potential due to a point charge, dipole, continuous charge distribution, Electric field calculation from electric potential, Equipotential surface, Potential gradient.	1,2	Text-1 Ref.-1,5,7	Lecture, Problem solving, Q/A
	12	Review Class			
		MID TERM EXAMINATION			
	13	Capacitors, Capacitors in series and parallel, Energy of charged capacitors, Electrical energy density in terms of electric field, Electron volt, Dielectric media, Polarization vector & displacement vector.	1,2,3	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A, Assignment
	14	Laplace's and Poission's equations, Capacitor with a dielectric material, Gauss's law with dielectric, Current, Resistance & Electromotive Force: Current and current density.	1,2	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A
	15	Resistance and Resistivity, Ohm's law, EMF, Power, Resistance in series and parallel, Kirchhoff's Rules, RC circuit.	1,2	Text-1,3 Ref.-1,3,5	**Quiz-3,** Lecture, Ass-ignment, Problem solving,Q/A
	16	Magnetic field, Magnetic flux and flux density, Lorentz Force, Gauss's law for magnetism, Motion of a charged particles in magnetic field: Hall effect; Magnetic field intensity.	1,2	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A, Assignment
	17	Magnetic Dipole Moment, Biot-Savart Law, Ampere's law and its applications; Magnetic properties of material, Magnetization, Hysteresis.	2	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A
	18,19	Induced emf and Faraday's law of induction; Lenz's law;	1,2,3	Text-1,3	Lecture,

	Mutual inductance ; Self-inductance; Energy in an inductor; Inductance in series, in parallel, and their combination, MMF, leakage and fringing flux, Transformers.		Ref.-1,3,5	Problem solving, Q/A, Assignment
20	Quantum Physics: Quantum Theory of Radiation, Energy of photons, Photo-electric Effect, work function, threshold frequency, threshold voltage, Compton Effect	1,3	Text-1,3 Ref.-1,3,5	**Quiz-4,** Lecture, Ass-ignment, Problem solving, Q/A
21	X-rays production, properties and application, Bragg Diffraction, De Broglie wave length, Heisenberg's Uncertainty Principle, Correspondence principle, Pair production, Pair annihilation.	1,3	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A, Assignment
22,23	Wave function, Schrodinger equation-Time dependent and time independent form, Expectation value, Quantum Operator, Tunneling effect, Quantum numbers, Energy of trapped electron, Quantum dots and corrals, Quantization of Bohr orbital energy.	1,3	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A
24	REVIEW CLASS			
	FINAL WRITTEN EXAM			

Appendix 1: Assessment Methods

Assessment Types	Marks
Attendance	5%
Assignments	5%
Class Tests	20%
Mid Term	30%
Final Exam	40%

Appendix 2: Grading Policy

Letter Grade	Marks %	Grade Point	Letter Grade	Marks %	Grade Point
A (Plain)	90-100	4.00	C+ (Plus)	70-73	2.33
A- (Minus)	86-89	3.67	C (Plain)	66-69	2.00
B+ (Plus)	82-85	3.33	C- (Minus)	62-65	1.67
B (Plain)	78-81	3.00	D+ (Plus)	58-61	1.33
B- (Minus)	74-77	2.67	D (Plain)	55-57	1.00
			F (Fail)	<55	0.00

Appendix-3: Program outcomes

POs	Program Outcomes
PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to identify, formulate, and solve engineering problems
PO3	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO4	An ability to design and conduct experiments, as well as to analyze and interpret data
PO5	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO6	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO7	A knowledge of contemporary issues
PO8	An understanding of professional and ethical responsibility
PO9	An ability to function on multidisciplinary teams
PO10	An ability to communicate effectively
PO11	Project Management and Finance
PO12	A recognition of the need for, and an ability to engage in life-long learning