UNITED INTERNATIONAL UNIVERSITY

Department of Computer Science and Engineering (CSE)

Course Syllabus

1	**Course Title**	Physics
2	**Course Code**	PHY 2105/PHY 105
3	**Trimester and Year**	Spring, 2025
4	**Pre-requisites**	Fundamental Physics
5	**Credit Hours**	3
6	**Section**	N
7	**Class Hours**	Saturday (12:31pm-01:50pm), Tuesday (12:31pm-01:50pm)
8	**Class Room**	301
9	**Instructor's Name**	Nayeem Bin Zahid
10	**Email**	Nayeem.zahid12@gmail.com
11	**Office**	310, Please call on 01534147141, if necessary.
12	**Counseling Hours**	Saturday (9:51am-12:30pm, 3:11pm – 4:30pm), Tuesday (9:51am-12:30pm, 3:11pm – 4:30pm), Wednesday (09:51 am – 2:00 pm) **If you need additional counselling, do mail me at the given email ID, and I will arrange zoom meetings accordingly.
13	**Text Book**	**1. Fundamentals of Physics-D. Halliday, R. Resnick & J. Walker (10th Ed.)** **2.** Physics [Volume 1] (5thEdition) – R. Resnick, D. Halliday, K. Krane **3.** University Physics - Sears, Zemansky, Young & Freedman (12th Ed.)
14	**Reference**	1. Physics for Engineers - Giasuddin Ahmad (Part-1 & 2) 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. Concept of Modern Physics - Arthur Beiser (6th Ed.) 6. Atomic and Nuclear Physics – N. Subrahmanyam & Brij Lal.

15	**Course Contents (approved by UGC)**	**Waves & Oscillations:** Periodic motion: Periodic waves, Elastic restoring force, Simple harmonic motion (SHM), Differential equation of SHM & its solutions, Examples of SHM, Energy calculation of SHM, Time period, velocity, acceleration, frequency calculation with graph, Lissajou's figure design, Spring mass system and Torsional pendulum, DHM, Characteristic graph, Differential equations for Spring mass system with damping mechanism and RLC circuit-series and parallel analysis, Resonant frequency, Reactance, Impedance, FHM. Mechanical Waves, Vibrating Bodies and Acoustic Phenomena: Progressive wave and its differential equation, EM wave, Group velocity, Phase velocity, Standing waves, Node and antinode. The Doppler effects, Application of acoustic Phenomena. **Electricity magnetism:** Electrostatic Force & Electric Field: 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. Electric Potential: 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. Capacitance & Dielectric: 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, Laplace's and Poission's equations, Capacitor with a dielectric material, Gausses law with dielectric. Current, Resistance & Electromotive Force: Current and current density, Resistance and Resistivity, Ohm's law, EMF, Power, Resistance in series and parallel, Kirchhoff's Rules, RC circuit. Magnetic Field: 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, Magnetic Dipole Moment, Biot-Savart Law, Ampere's law and its applications; Magnetic properties of material, Magnetization, Hysteresis. Inductions and Inductance: Induced emf and Faraday's law of induction; Lenz's law; Mutual inductance ; Self-inductance; Energy in an inductor; Inductance in series, in parallel, and their combination, MMF, leakage and fringing flux, Transformers. **Quantum Physics:** Quantum theory: Quantum Theory of Radiation, Energy of photons, Photo-electric Effect, work function, threshold frequency, threshold voltage, Compton Effect, X-rays production, properties and application, Bragg Diffraction, De Broglie wave length, Heisenberg' s Uncertainty Principle, Correspondence principle, Pair production, Pair annihilation. Schrodinger equation: 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.
16	**Course Outcomes (COs)**	1. **Explain** different physical quantities with examples, **identify** behavior of motions in various systems, and **define** parameters with waves & oscillations, electricity-magnetism and quantum & modern physics. 2. **Demonstrate** the various equations of SHM-DHM-FHM, wave motion, electric field-potential, potential energy, dipole moment, different laws, combinations of capacitors-resistors-inductors, and **describe** different physical-electrical-quantum processes by analytical and graphical tools for numerous events.

		3. Evaluate different numerical problems based on the basic characteristics of wave equation, equations on electric field-magnetic field, energy stored, applications on quantum-modern physics and **apply** the concepts flourished with theorem to perform simple and advantage engineering calculations.
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 kineticand 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	1,2,4,5	Text-1,2,3 Ref.-1	Lecture, Mathematical Problem solving, Q/A
3	Combination of Simple Harmonic Oscillations: Lissajous Figures, time period of simple physical pendulum, Spring Mass System.	1,2,4	Text-1,2,3 Ref.-1,4	Lecture, Problem solving, Q/A,
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 representationof amplitude and frequency vs. time for different DHM	1,2,4	Text-1,2,3 Ref.-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,	1,2,5	Text-1,3 Ref.-1,2,4	Lecture, Problem solving, Q/A

	Resonance frequency, Two-body Oscillation, Reduce Mass			
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	1,2,3,4, 5	Text-1,3 Ref.-1,4	**Quiz 1,** Lecture, Problem solving, Q/A,
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	1,4,5	Text-1,2,3 Ref.-1	Lecture, Problem solving, Q/A
9	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.	1,3,5	Text-1,3 Ref.-1	Lecture, Problem solving, Q/A, Assignment
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.	1,3,5	Text-1,3 Ref.-1,7	**Quiz-2,** 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.	1,5	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.	1,3,5	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, RCcircuit.	1,5	Text-1,3 Ref.-1,3,5	**Quiz-3,** Lecture, Assignment, 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.	1,5	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.	1	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; Mutual inductance ; Self-inductance; Energy in an inductor; Inductance in series, in parallel, and their combination, MMF, leakage and fringing flux, Transformers.	1,5	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A, Assignment
20	Quantum Physics: Quantum Theory of Radiation, Energyof photons, Photo-electric Effect, work function, threshold frequency, threshold voltage, Compton Effect	1,3,5,6	Text-1,3 Ref.-1,3,5	**Quiz-4,** Lecture, Assignment, Problem solving, Q/A
21	X-rays production, properties and application, Bragg Diffraction, De Broglie wave length, Heisenberg's	1,3,5,6	Text-1,3 Ref.-1,3,5	Lecture, Problem solving, Q/A, Assignment

	Uncertainty Principle, Correspondence principle, Pair production, Pair annihilation.			
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, Quantizationof Bohr orbital energy.	1,3,6	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