United International **University** (UIU)
School of Science and Engineering
Course Outline
Course Code: PHY 105/2105; Title: PHYSICS
Section: A Trimester: Fall 2020

Classes: Sunday (2:00-3:30 pm), Wednesday (2:00-3:30 pm)

Course Teacher: Md. Asaduzzaman (MAn)

Counselling hours: Saturday (10.00-1.00 pm, 2.10-3.30 pm), Sunday (12.30-1.40 pm, 4.00-6.00 pm), Tuesday (10.00-1.00 pm, 2.10-3.30 pm), Wednesday (12.30-1.40 pm, 4.00-6.00 pm).

Class Room : 404

Office room : 619

Cell : 01912367977

Email : asad@ins.uiu.ac.bd

Text Books:

1. Fundamentals of Physics - D. Halliday, R. Resnick, & J. Walker-10th Edition.
2. *Physics for* Engineers- Dr. Giasuddin Ahmad**.**
3. *Concepts of Modern Physics* – Arthur Beiser (6th edition)**.**

Reference Books:

1. *Outlines of Physics* - Dr. Giasuddin Ahmad**.**
2. *Fundamentals of Physics* - D. Halliday, R. Resnick & R. Krane**.**
3. *Atomic Physics By S. N Ghoshal.*
4. *University Physics By Sears, Zemansky, Young, Freedman (12th)*
5. *Atomic and Nuclear Physics* – N. Subrahmanyam & Brij Lal
7. *Modern Physics* – J. B. Rajam.

Assignment: There will be at least two (or more) assignments.

Quiz: There will be total four quizzes in class. The best three will be taken.

Exams: Mid-terms and final exams will be closed book, closed notes. The materials for final exam will be informed in due time. There will be no grade exemptions from the final. Final examination is not comprehensive.

Test Policy:

All students must attend at the Class Tests, Midterm and Final examination.

- **If a student is absent from a Midterm exam, he/she must inform the instructor beforehand**

- **(at least 12 hours before the exam) and must submit an application with valid documents if he/she should be considered for a retake examination. Otherwise, his/her grade for that examination will be zero.**
- A student once appeared at a Midterm will not be allowed to retake the examination again under any circumstances.
- **A student absent from a Class test will not be allowed to retake the test under any circumstances.**
- For the exam, the seating arrangement will be random.

Grading: The course grade will be determined from a weighted average of the quizzes, homework assignments, mid-term exams and the final. The weights are as follows:

Attendance	5%
Assignment	10%
Quiz	40%
Mid-term Exam	20 %
Final Exam	25 %
Total	100 %

Attendance Scheme: The Regular Class attendance will be taken. The students are advised to attend classes regularly.

Attendance %	Number	No of missing class	Obtained number
90-100%	5	1	5
85-89%	4.5	2	5
80-84%	4	3	4.5
75-79%	3.5	4	4
70-74%	3	5	4
65-69%	2.5	6	3.5
60-64%	2	7	3.5
55-59%	1.5	8	2.5
51-54%	1	9	2
50 % below	0	10	1.5
50 % below	0	11	1.5
50 % below	0	12	1
50 % below	0	13	0
50 % below	0	14	0

Course Grade:

The following scale will be used to convert numerical grades to letter grade:

Letter Grade	**Marks**	**Grade Point**	**Letter Grade**	**Marks**	**Grade Point**
A	90-100	4.0	C+	70-73	2.33
A-	86-89	3.67	C	66-69	2.00
B+	82-85	3.3	C-	62-65	1.67
B	78-81	3.0	D+	58-61	1.33
B-	74-77	2.67	D	55-57	1.00

Objectives:

Physics is the most fundamental of all the natural sciences, and its applications extend even to other areas of human endeavor. Physics is the study of the natural world based on quantitative observations and experiments. Physics attempts to discover simple rules by which observations of many different situations can be correlated within a common framework of fundamental ideas (physical laws). Physical laws and theories have profound influence on how we view our universe and ourselves. Ernest Rutherford said, "In science, there is only physics; all the rest is stamp collecting." Physics gets to the roots of all physical phenomena. **If you can think physics, you can think anything!**

The use of logical reasoning to make predictions about physical systems is very important in physics. Successful prediction concerning experiments not yet performed is the crucial test for our ideas about the nature of the universe. Without studying the fundamental laws of physics, one cannot develop his/her understanding in other related fields. If one wishes to study computer science, electronics, electrical engineering, telecommunication engineering and any other applied field he/she has to study this course thoroughly.

This course endeavors to provide a diversified knowledge in different fields of Physics with their practical applications pertaining to engineering students. The concept of heat and temperature and the fundamental laws that govern thermodynamic systems are discussed. The knowledge of electromagnetic waves with different phenomenon of light is another field to be covered. The course also familiarizes the students with the basic concepts of modern physics like the atomic physics, nuclear physics, wave particle duality and the special theory of relativity.

Class Schedule:

There will be 24 lectures as a whole. Mainly, there are three divisions. Each division has maximum eight lectures. Number of lectures shown may slightly vary.

Waves & Oscillations:

1. 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.

2. 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:

1. **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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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:

1. 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.

2. 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.