Department	FAST School of Computing (FSC)	**Semester**	Fall 2022
Course Title	Applied Physics	**Course Code**	NS1001
Prerequisite	-	**Credit Hrs.**	3
Course Moderator	Rimsha Bashir Awan (rimsha.bashir@nu.edu.pk)	**Semester**	1st

Course Objectives:

The Applied Physics course is aimed to introduce vector algebra, Newton's law to solve two- and three-dimensional systems, forces and objects in motion. It is also focused on evaluating simple harmonic motion (SHM), oscillations and waves. The last part of the course is designed for the learning of electricity & magnetism which includes Coulomb's law, Gauss's law, systems of capacitance, Ohm's law, Hall's effect, magnetic forces, current-carrying magnetism, and Ampere's law. The course is a pre-requisite of "Digital Logic Design".

Course Learning Objectives (CLOs)

At the end of the course, the students will be able:

1. Find position, displacement, velocity, acceleration in 1, 2 & 3 dimensions in numerical problems.
2. Learn projectile motion with the application of vector analysis to calculate horizontal/vertical motions, equation of the path and horizontal range to apply in numerical problems.
3. Apply Newton's Laws along with vector notations to evaluate different types of forces: gravitational/weight/normal/tension/friction to apply in numerical problems.
4. Verify SHM in learning different oscillations (simple, angular, uniform circular motion) for different pendulums/oscillators (torsional, simple).
5. Lean Different Types of Waves (Transverse & Longitudinal), Sinusoidal Waves and their respective parameters: Wavelength, Frequency, Angular Frequency, Wave number, Speed of wave.
6. To understand electric charge, electric current, resistance, resistivity and electric field with different applications through associated laws (i.e., Ohm's Law, Coulomb's law & Gauss' Law) and implement them to calculate related physical quantities in numerical problems.
7. To understand different types (parallel plate, cylindrical, spherical) & combinations (parallel/series) of capacitances to calculate capacitances along with the other associated physical quantities (e.g. potential difference) in numerical problems.
8. To understand magnetic fields & magnetic forces, their application as current carrying wire, Hall's effect and in circulating charges to calculate related physical quantities to solve numerical.
9. To understand magnetic fields generated due to currents by Ampere's law to calculate magnetic fields due to different conditions and geometries (e.g. Solenoid and Toroid) and calculate related physical quantities to apply in numerical problems.

Text Book(s)	**Title**	***Halliday & Resnick* Fundamentals of Physics (Extended 11th Edition)**
	Author(s)	Jearl Walker
	Publisher	© 2013 by John Wiley & Sons Inc.
Ref. Book(s)	**Title**	**Physics for Scientists and Engineers with Modern Physics (6th Edition)**
	Author(s)	Raymond A. Serway & John W. Jewett
	Publisher	© 2004 Thomson books/cole US
	Title	**Physics for Scientists and Engineers (6th Edition)**
	Author(s)	Paul A Tipler and Gene Mosca
	Publisher	W.H. Freeman and Company
	Title	**Physics for Scientists and Engineers (3rd Edition)**
	Author(s)	Fishbane, Gasiorowicz, Thornton
	Publisher	Pearson Prentice Hall
	Title	**Physics for Engineers & Scientists (3rd Edition Extended)**
	Author(s)	Hans C. Ohanian and John T. Markert
	Publisher	W. W. Norton & Company New York. London

Week	Course Contents/Topics	Chapter
01	Adding Vectors, Components of Vectors, Unit Vectors, Vector & Scalar Products, Position & Displacement (2/3 dimensions), Numerical Problems	03, 04
02	Average/Instantaneous Velocity/Acceleration, Projectile Motion, horizontal/vertical motions	04
03	Projectile Motion: equation of the path, max. height, time of flight and horizontal range, Uniform Circular Motion, Numerical Problems **Assessment Methodology: Quiz 1**	04
04	Newton Laws of Motion, Forces (1D/2D): Gravitational, Friction, Tension, Weight, Numerical Problems **Assessment Methodology: Assignment 1**	05
05	Simple Harmonic Motion, the Force Law for SHM, Energy in Simple Harmonic Motion, Angular SHM **Assessment Methodology: Quiz 2**	15
06	**MID TERM – I**	
07	Simple Pendulum, Circular Motion & SHM, Damped Simple Harmonic Motion, Forced Oscillations and Resonance, Numerical Problems **Assessment Methodology: Assignment 2**	15
08	Types of Waves, Sinusoidal Waves, Wavelength and Frequency, Standing Waves and Resonance **Assessment Methodology: Quiz 3**	16
09	Coulomb's Law, Charge Quantization & Conservation, Electric Field, Electric Field Due to Point Charge and Dipole, Numerical Problems **Assessment Methodology: Assignment 3**	21, 22
10	Gauss' Law, Flux, Flux of Electric Field, Gauss's Law, Equivalency of Gauss's Law and Coulombs' Law **Assessment Methodology: Quiz 4**	23
11	Cylindrical Symmetry, Planar Symmetry, Spherical Symmetry, Numerical Problems	23
12	**MID TERM – II**	
13	Capacitance, Parallel Plate, Cylindrical & Spherical Capacitors, Capacitors in Parallel and In Series, Numerical Problems **Assessment Methodology: Assignment 4**	25
14	Electric Current, Current Density and Drift Speed, Resistance & Resistivity, Ohm's Law, Numerical Problems **Assessment Methodology: Quiz 5**	26
15	Magnetic Fields and Field Lines, Crossed Fields: Hall Effect, Circulating Charge Particles, Magnetic Force On Current Carrying Wire, Numerical Problems **Assessment Methodology: Assignment 5**	28
16	Magnetic Field Due to Current, Ampere's Law, Magnetic Field Inside/Outside Wire, Solenoids & Toroids & Between two Parallel Wires, Numerical Problems **Assessment Methodology: Quiz 6**	29

Course Assessment:

Assessment Tools	Weightage
Quizzes (6)	10%
Assignment (5)	5%
CP	5%
Midterms (I+II)	15% +15%
Final Exam	50%

Teaching Methodology:
Lecturing, Assignments, Quizzes, Discussion, Midterm exams, presentations etc.

Important Instructions:

- Plagiarism is not tolerable in any of its form; minimum penalty would be an 'F' grade in the course without prior warning.