COURSE DESCRIPTION FORM

INSTITUTION National University of Computer and Emerging Sciences (NUCES-FAST)

PROGRAM (S) TO BE EVALUATED BS(CS) & BS(SE)

A. Course Description

Course Code	NS (1001)
Course Title	APPLIED PHYSICS
Credit Hours	3
Prerequisites by Course(s) and Topics	None
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	Assessment with the weight.

Assessment Type	Weight
Assignments / Quizzes	20 %
Mid-Terms	30 (15 each) %
Final	50%

Course Coordinator	Rabia Tabassum
URL (if any)	
Current Catalog Description	**Part A:** Adding Vectors, Components of Vectors, Unit Vectors, Vector & Scalar Products, Position & Displacement (2/3 dimensions), Average/Instantaneous Velocity/Acceleration, Projectile Motion, Uniform Circular Motion, Newton Laws of Motion, Forces (1D/2D/3D): Gravitational, Friction, Tension, Weight. **Part B:** Simple Harmonic Motion, the Force Law for SHM, Angular SHM, Simple Pendulum, Circular Motion & SHM, Types of Waves, Sinusoidal Waves, Wavelength and Frequency **Part C:** Electric Charge, Coulomb's Law, Electric Field, Electric Field Due To Point Charge, Due To Electric Dipole, Gauss' Law, Flux Of Electric Field, Cylindrical/Planar/Spherical Symmetries, Capacitance, Parallel Plate/Cylindrical/Spherical Capacitors, Capacitors In Parallel And In Series, Electric Current, Current Density, Drift Speed, Resistance & Resistivity, Ohm's Law, Magnetic Fields And Field Lines, Hall Effect, Circulating Charge Particles, Magnetic Force On Current Carrying Wire, Magnetic Field Due To Current, Ampere's Law, Magnetic Field Inside/Outside Wires/Between Parallel Wires/Solenoid/&Toroid.
Textbooks	1. ***Halliday & Resnick* Fundamentals of Physics (Extended 10th Edition),** Jearl Walker, © 2013 John Wiley & Sons Inc.
Reference Books/ Material	1. **Physics for Scientists and Engineers with Modern Physics (6th Edition),** Raymond A. Serway & John W. Jewett, © 2004 Thomson books/cole US 2. **Physics for Scientists and Engineers (6th Edition),** Paul A Tipler and Gene Mosca, W.H. Freeman and Company 3. **Physics for Scientists and Engineers (3rd Edition),** Fishbane, Gasiorowicz, Thornton, Pearson Prentice Hall. 4. **Physics for Engineers & Scientists (3rd Edition Extended),** Hans C. Ohanian and John T. Markert, W. W. Norton & Company New York. London

Course Goals	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".

A. Course Learning Outcomes (CLOs)

CLO	Course Learning Outcome (CLO)	Domain	Taxonomy Level	PLO	Tools
01	To add vectors geometrically, find their components along with scalar and vector products. Apply vector analysis to find position, displacement, velocity, acceleration in 1, 2 & 3 dimensions in numerical problems or Python simulation code/programming.	Cognitive	C2 (Comprehension) C4 (Analysis)	1, 2, 3, 6	A1, Q1, M1, F
02	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 or Python simulation code/programming.	Cognitive	C3 (Applying)	1, 2, 3, 4, 6	A2, Q2, M1, F
03	Apply Newton's Laws along with vector notations to evaluate different types of forces: gravitational/weight/normal/tension/friction to apply in numerical problems or Python simulation code/programming.	Cognitive	C3 (Applying)	1, 2, 3, 6	A2, Q2, M1, F
04	Verify SHM in learning different oscillations (simple, angular, uniform circular motion) for different pendulums/oscillators (torsional, simple).	Cognitive	C6 (Evaluation)	1, 2, 3, 6	A3, Q3, M2, F
05	Lean Different Types of Waves (Transverse & Longitudinal), Sinusoidal Waves and their respective parameters: Wavelength, Frequency, Angular Frequency, Wave number, Speed of wave.	Cognitive	C4 (Analysis)	1, 2, 3, 6	A3, Q3, M2, F
06	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 or Python simulation code/programming.	Cognitive	C1 (Knowledge) C3 (Application) C4 (Analysis)	1, 2, 3, 4, 5, 6	A4, Q4, M2, F
07	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.	Cognitive	C3 (Application) C4 (Analysis	1, 2, 3, 4, 5, 6	A5, Q5, M2, F
08	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 problems or Python simulation codes.	Cognitive	C2 (Comprehension) C3 (Applying)	1, 2, 3, 4, 5, 6	A5, Q5, M2, F
09	To understand magnetic fields generated due to currents by Ampere's law to calculate magnetic fields due to different conditions and geometries (e.g. Solenoids and Toroids) and calculate related physical quantities to apply in numerical problems or Python simulation.	Cognitive	C3 (Applying) C3 (Applying)	1, 2, 3, 4, 5, 6	A6, Q6, F

Tool: Q = Quiz, A = Assignment, M = Mid-term, F=Final (End-term)

B. Program Learning Outcomes

For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent.

1. Academic Education:	To prepare graduates as computing professionals	✔
2. Knowledge for Solving Computing Problems:	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.	✔ ✔
3. Problem Analysis:	Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.	✔
4. Design/ Development of Solutions:	Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	✔
5. Modern Tool Usage:	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.	✔
6. Individual and Team Work:	Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.	✔
7.Communication:	Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.	
8. Computing Professionalism and Society:	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.	
9. Ethics:	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.	
10. Life-long Learning:	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.	

C. Relation between CLOs and PLOs
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs									
		1	2	3	4	5	6	7	8	9	10
CLOs	1	✔	✔	✔			✔				
	2	✔	✔	✔	✔		✔				
	3	✔	✔	✔			✔				
	4	✔	✔	✔			✔				
	5	✔	✔	✔			✔				
	6	✔	✔	✔	✔	✔	✔				
	7	✔	✔	✔	✔	✔	✔				
	8	✔	✔	✔	✔	✔	✔				
	9	✔	✔	✔	✔	✔	✔				

Topics Covered in the Course, with Number of Lectures on Each Topic

1. Topics to be covered:

List of Topics	No. of Weeks	Contact Hours	CLO
Adding Vectors, Components of Vectors, Unit Vectors	1	3	1
Vector & Scalar Products, Position & Displacement (2/3 dimensions)	1	3	1
Average/Instantaneous Velocity/Acceleration, Uniform Circular Motion	1	3	1
Projectile Motion, horizontal/vertical motions, equation of the path and horizontal range	1	3	2
Newton Laws of Motion, Forces (1D/2D): Gravitational, Friction, Tension, Weight.	1	3	3
MIDTERM I			
Simple Harmonic Motion, the Force Law for SHM, Angular SHM, Circular Motion & SHM	1	3	4
Types of Waves, Sinusoidal Waves, Wavelength and Frequency	1	3	5
Coulomb's Law, Charge Quantization & Conservation, Electric Field, Electric Field Due To Point Charge and Dipoles	1	3	6
Gauss' Law, Flux, Flux Of Electric Field, Gauss's Law, Equivalency of Gauss's Law And Coulombs' Law	1	3	6
Gauss' Law: Cylindrical Symmetry, Planar Symmetry, Spherical Symmetry	1	3	6
MIDTERM II			
Capacitance, Parallel Plate, Cylindrical & Spherical Capacitors, Capacitors In Parallel And In Series	1	3	7
Electric Current, Current Density and Drift Speed, Resistance & Resistivity, Ohm's Law	1	3	6
Magnetic Fields And Field Lines, Crossed Fields: Hall Effect, Circulating Charge Particles, Magnetic Force On Current Carrying Wire	1	3	8
Magnetic Field Due To Current, Ampere's Law, Magnetic Field Inside/Outside Wire, Solenoids & Toroids & Between two Parallel Wires	1	3	9
FINAL TERM EXAM			
Total	**15**	**44**	

Laboratory Projects/Experiments Done in the Course	-
Programming Assignments Done in the Course	Yes, Algorithms of Python software will be studied in order to understand the Physics concepts in detail.

Class Time Spent on (in credit hours)	**Theory**	**Problem Analysis**	**Solution Design**	**Social and Ethical Issues**
	20	20	5	0

Oral and Written Communications	

Instructor Name: Qurat ul ain Sohail