COURSE DESCRIPTION FORM

INSTITUTION National University of Computer and Emerging Sciences

PROGRAM (S) TO BE EVALUATED Computer Science

A. Course Description

Course Code	NS1001
Course Title	APPLIED PHYSICS
Credit Hours	3
Prerequisites by Course(s) and Topics	NIL
Assessment Instruments with Weights (assignments, quizzes, midterms, final)	Assessment with weight. **Assessment Type** — **Weight** Assignments and Quizzes — 20 (10+10) Mid-Terms — 30 (15 each) Final — 50
Course Coordinator	Mr. Muhammad Rahim
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, Damped SHM, 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 Wire/Between Parallel Wires
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 5. University Physics with Modern Physics by Young and Freedman 12 Edition, Addison Wesley New Yark

Course Goals

A. Course Learning Outcomes (CLOs)

1. To add vectors geometrically, find their components along with scalar and vector products.
2. Apply vector analysis to find position, displacement, velocity, acceleration in 1, 2 & 3 dimensions in numerical problems or Python simulation code/programming.
3. Learn projectile motion with the application of vector analysis to calculate horizontal/vertical motions, equation of the path and horizontal range in numerical problems or Python simulation code/programming.
4. Apply Newton's Laws along with vector notations to evaluate different types of forces: gravitational/weight/normal/tension/friction in numerical problems or Python simulation code/programming.
5. Verify SHM in learning different oscillations (simple, angular, damped, uniform circular motion) for different pendulums/oscillators (torsional, simple, damped).
6. Lean Different Types of Waves, Sinusoidal Waves, Wavelength and Frequency
7. To understand electric charge, electric current, resistance 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.
8. To understand different types & combinations of capacitances and calculate capacitances along with the other associated physical quantities in numerical problems.
9. To understand magnetic fields & magnetic forces, their application as Hall's effect and in circulating charges to calculate related physical quantities in numerical problems or Python simulation codes.
10. 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 in numerical problems or Python simulation codes.

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	✔	✔	✔	✔	✔	✔				

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, Vector & Scalar Products,	1	3	1
Position & Displacement (2/3 dimensions)	1	3	2
Average/Instantaneous Velocity/Acceleration, Uniform Circular Motion	1	3	2
Projectile Motion, horizontal/vertical motions, equation of the path and horizontal range	1	3	3
Newton Laws of Motion, Forces (1D/2D): Gravitational, Friction, Tension, Weight.	1	3	4
Simple Harmonic Motion, the Force Law for SHM, Angular SHM	1	3	5
Simple Pendulum, Damped SHM, Circular Motion & SHM,	1	3	5
Types of Waves, Sinusoidal Waves, Wavelength and Frequency	1	3	6
Electric Charge, Coulomb's Law, Electric Field, Electric Field Due To Point Charge	1	3	7
Gauss' Law, Flux, Flux Of Electric Field, Gauss's Law, Equivalency of Gauss's Law And Coulombs' Law	1	3	7
Cylindrical Symmetry, Planar Symmetry, Spherical Symmetry	1	3	8
Capacitance, Parallel Plate, Cylindrical & Spherical Capacitors, Capacitors In Parallel And In Series	1	3	8
Electric Current, Current Density and Drift Speed, Resistance & Resistivity, Ohm's Law	1	3	7
Magnetic Fields And Field Lines, Crossed Fields: Hall Effect, Circulating Charge Particles, Magnetic Force On Current Carrying Wire	1	3	9
Magnetic Field Due To Current, Ampere's Law, Magnetic Field Inside/Outside Wire, Solenoids & Toroids & Between two Parallel Wires	1	3	10
Total	**15**	**45**	

Laboratory Projects/Experiments Done in the Course

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Programming Assignments Done in the Course

Yes, Algorithms in PYTHON will be developed in order to understand the Physics concepts in more 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