

# SRM University – AP, Andhra Pradesh

Neerukonda, Mangalagiri Mandal  
Guntur District, Mangalagiri, Andhra Pradesh 522240

## PHY 101 Engineering Physics

<b>Course Code</b>	PHY101	<b>Course Category</b>	Core Course	<b>L-T-P-C</b>	3	0	0	3
<b>Pre-Requisite Course(s)</b>	NA	<b>Co-Requisite Course(s)</b>	NA	<b>Progressive Course(s)</b>	NA			
<b>Course Offering Department</b>	Physics	<b>Professional / Licensing Standards</b>						
<b>Board of Studies Approval Date</b>		<b>Academic Council Approval Date</b>						

### Course Objectives / Course Learning Rationales (CLRs)

**Objective 1:** To understand fundamental concepts of classical mechanics.

**Objective 2:** To understand behaviour of mechanical and electromagnetic waves.

**Objective 3:** To learn three fundamental laws of thermodynamics and related topics.

**Objective 4:** To learn Maxwell's Equation of Electromagnetism and electrostatic interactions.

**Objective 5:** To learn about Maxwell's Equation II, III, IV & origin of magnetostatic interactions.

### Course Outcomes / Course Learning Outcomes (CLOs)

	<b>At the end of the course, the learner will be able to</b>	<b>Bloom's Level</b>	<b>Expected Proficiency Percentage</b>	<b>Expected Attainment Percentage</b>
<b>Outcome 1</b>	Understanding fundamental concepts of classical mechanics	3	70%	65%
<b>Outcome 2</b>	Understanding behaviour of mechanical and electromagnetic waves	3	70%	65%
<b>Outcome 3</b>	Learning three fundamental laws of thermodynamics and related topics.	3	70%	65%
<b>Outcome 4</b>	Learning four Maxwell's Equations as foundation for Electromagnetism. Understanding Maxwell's Equation-I, & electrostatic interaction.	3	70%	65%
<b>Outcome 5</b>	Understanding Maxwell's Equation-II, III & IV. Learning Magnetostatic interaction and magnetic materials.	3	70%	65%

### Course Articulation Matrix (CLO) to Program Learning Outcomes (PLO)

CLOs	Program Learning Outcomes (PLO)														
	Scientific and Disciplinary Knowledge	Analytical Reasoning and Problem Solving	Critical and Reflective Thinking	Scientific Reasoning and Design Thinking	Research Related Skills	Modern Tools and ICT Usage	Environment and Sustainability	Moral, Multicultural and Ethical Awareness	Individual and Teamwork Skills	Communication Skills	Leadership Readiness Skills	Self-Directed and Life Long Learning	PS O 1	PS O 2	PS O 3
Outcome 1	3	3	3	2	1				2			2	3	1	2
Outcome 2	3	3	3	3	2				2			2	3	2	2
Outcome 3	3	3	3	3	2				2			2	3	2	2
Outcome 4	3	3	3	3	2				3			2	3	2	2
Outcome 5	3	3	3	3	3				2			3	3	2	2
<b>Course Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>				<b>2</b>			<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>

### Course Unitization Plan

Unit No.	Unit Name	Required Contact Hours	CLOs Addressed	References
<b>Unit 1</b>	<b>CLASSICAL MECHANICS</b>	<b>9</b>		
1.	Vector calculus and Kinematics	1	1	1, 2
2.	Dynamics: Contact forces, Static friction, kinetic friction and worked examples.	1	1	1, 2
3.	Free body force diagram; Applications of Newton's law. Worked examples (i.e., pulley, inclined planes)	1	1	1, 2
4.	Momentum and Impulse, Conservation of linear momentum	1	1	1, 2
5.	Calculation of Centre of mass for complex systems	1	1	1, 2
6.	Work and Kinetic Energy Theorem, Motion at inclined plane	1	1	1, 2
7.	Conservation of mechanical energy: Worked out problems	1	1	1, 2
8.	Rotational motion: MoI, Torque, Angular momentum, and Conservation of Angular Momentum.	1	1	1, 2
9.	Newtons Laws of Universal Gravitation. Kepler's Law & Planetary motion.	1	1	1, 2
<b>Unit 2</b>	<b>WAVES, OSCILLATIONS AND OPTICS</b>	<b>9</b>		
10.	Simple harmonic motion: position, velocity, and acceleration	1	2	1, 2

11.	Circular Analogy of SHM and Simple Pendulum	1	2	1, 2
12.	Compound Pendulum and Torsional Pendulum.	1	2	1, 2
13.	Damped harmonic oscillations.	1	2	1, 2
14.	Forced harmonic oscillations, Quality factor, Bandwidth & Resonance.	1	2	1, 2
15.	Longitudinal & Transverse Wave, Traveling and Standing Wave.	1	2	1, 2
16.	Concept of Electromagnetic waves – Geometrical & Physical Optics	1	2	1, 2
17.	Conditions of Interference: Young's Double Slit Experiment	1	2	1, 2
18.	Introduction to Diffraction Patterns: Fresnel and Fraunhofer Diffraction	1	2	1, 2
<b>Unit 3</b>	<b>THERMODYNAMICS</b>	<b>9</b>		
19.	Zeroth law of thermodynamics and concept of temperature	1	3	1, 2
20.	Types of Thermometers and temperature scales: inter-relation among temperature scales	1	3	1, 2
21.	Introduction of Heat and Internal energy	1	3	1, 2
22.	Calorimetry and Concept of Specific Heat	1	3	1, 2
23.	Concept of Work and inter-relation among Heat, Work, and IE: First Law of Thermodynamics	1	3	1, 2
24.	Application of 1 <sup>st</sup> law of thermodynamics & introduction of thermodynamic processes – adiabatic, isothermal etc.	1	3	1, 2
25.	Second law of thermodynamics: Heat Pump and Heat Engines	1	3	1, 2
26.	Concept of Entropy: Reversible and Irreversible Process	1	3	1, 2
27.	Thermodynamic Phases and phase transitions: Concept of Latent Heat	1	3	1, 2
<b>Unit 4</b>	<b>ELECTRO-MAGNETISM - I</b>	<b>9</b>		
28.	Describe Maxwell Equations as the foundation of electromagnetism. Derive differential forms starting from Integral forms. Discuss Physical Significance.	1	4	1,2
29.	<b>Focus on Maxwell's Equation I:</b> Discuss lines of force and Electrostatic flux, Introduce Gauss's law (differential and integral form)	1	4	1, 2
30.	Application of Gauss Law: ES field due to infinite wire and sheet.	1	4	1, 2
31.	Electrostatic field due to conducting and insulating sphere & cylinder.	1	4	1, 2
32.	Discuss Coulomb's Law as an alternative & direct approach to calculate electrostatic field – superposition principle, electrostatic field due to discrete charges.	1	4	1, 2
33.	Concept of Electrostatic Potential and Potential Energy. Inter-relation with electrostatic field.	1	4	1, 2

34.	Capacitor and Capacitance: Capacitance of a parallel plate capacitor.	1	4	1, 2
35.	Electric dipole and dipole moment, Electric potential, and electrostatic field due to a physical dipole.	1	4	1, 2
36.	Definition and inter-relation of Polarization P, Electric displacement D, Electric susceptibility, and relative permittivity.	1	4	1, 2
<b>Unit 5</b>	<b>ELECTRO-MAGNETISM - II</b>	<b>9</b>		
37.	<b>Focus on Maxwell's Equation II:</b> Discuss absence of Magnetic monopoles! Introduce Magnetic Vector potential using vector calculus.			
38.	<b>Focus on Maxwell's Equation IV:</b> Discuss Ampere's circuital law. Calculate Magnetic field due to Infinite wire and Solenoid using Ampere's Law.	1	5	3. 4
39.	Introduce Biot-Savart Law as an alternative approach to calculate magnetic field. Calculate Magnetic field due to finite current element using Biot Savart Law.	1	5	3. 4
40.	Derive force between parallel current - define 1 Ampere using magnetic force.	1	5	3. 4
41.	Calculate magnetic field due to circular loop using Biot Savart Law			
42.	<b>Focus on Maxwell's Equation III:</b> Lenz's Law and Faraday's law: Induced EMF and Current	1	5	3. 4
43.	Definition and inter-relation between Magnetic field, magnetic moment, magnetization, magnetic induction, magnetic susceptibility, and permeability.	1	5	3. 4
44.	Discuss classification of Magnetic materials,	1	5	3. 4
45.	Ferromagnetic materials, Hysteresis loss, B-H curve	1	5	3. 4
<b>TOTAL CONTACT HOURS</b>		<b>45</b>		

### Recommended Resources

1. University Physics with Modern Physics with Mastering Physics - D Young, Roger A Freedman And Lewis Ford, XII Edition (2018), Publisher – PEARSON
2. Physics for Scientist and Engineers - Raymond A. Serway, John W. Jewett, XIX Edition (2017), Publisher - Cengage India Private Limited
3. Concept of Modern Physics - Arthur Beiser, Shobhit Mahajan, S Rai, 2017 Edition, Publisher - Tata McGraw Hill

### Other Sources

1. Introduction to Electrodynamics – David J. Griffiths. 4th Edition (2012), Publisher - PHI Eastern Economy Editions
2. Electricity and Magnetism - A S Mahajan and A A Rangwala, Revised of 1 Edition (2001), Publisher - McGraw-Hill
3. Advanced Engineering Mathematics - Erwin Kreyszig, X Edition (2016), Publisher - Wiley

### Learning Assessment

Bloom's Level of Cognitive Task		Continuous Learning Assessments (50%)								End Semester Exam (50%)	
		CLA-1 (10%)		Mid-1 (15%)		CLA-2 (10%)		Mid-2 (15%)		Th	Prac
		Th	Prac	Th	Prac	Th	Prac	Th	Prac		
Level 1	Remember Understand	60%		40%		60%		40%		70%	
Level 2	Apply Analyse	40%		60%		40%		60%		30%	
Level 3	Evaluate Create										
<b>Total</b>		<b>100%</b>		<b>100%</b>		<b>100%</b>		<b>100%</b>		<b>100%</b>	

### Course Designers

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