



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**  
**DEPARTMENT OF PHYSICS**  
**PROGRAMME -B.Sc. PHYSICS**

**Programme Learning Outcomes**

Graduates of a Bachelor's Degree will have a broad and coherent body of knowledge in their disciplines, with a deep understanding of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

PLO.NO.	PROGRAMME LEARNING OUTCOMES At the end of an undergraduate programme students will be able to
1.	Describe and define critical concepts in their discipline
2.	Explain and discuss concepts and ideas pertaining to their discipline
3.	Demonstrate a broad understanding of their discipline
4.	Demonstrate communication skills to present a clear, coherent and independent exposition
5.	of knowledge and ideas
6.	Demonstrate understanding of the interconnections of knowledge within and across
7.	disciplines
8.	Apply knowledge, theories, methods, and practices in their chosen field of study to address
9.	real-world challenges and opportunities
10.	Demonstrate proficiency in experimental techniques and methods of analysis appropriate
11.	for their area of specialisation
12.	Generate and analyse data using appropriate quantitative tools
13.	Construct and test hypotheses
14.	Demonstrate cognitive and technical skills to synthesise knowledge in interrelated
15.	disciplines
16.	Demonstrate critical thinking and judgement in identifying and solving problems with
17.	intellectual independence
18.	Demonstrate the skills needed to be able to function successfully in their field
19.	Show responsibility and understanding of local and global issues
20.	Demonstrate through their actions and speech that they are agents of social justice and
21.	change
22.	Practice the discipline's code of ethics in their academic, professional and personal lives

PSLO NO.	PROGRAMME SPECIFIC LEARNING OUTCOMES
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	On successful completion of the course, students will be able to
1.	Acquire an understanding of core knowledge in Physics, including the major premises of Classical Mechanics, Electricity and Magnetism and Modern Physics.
2.	Develop proficiency in mathematics and the mathematical concepts needed for a proper understanding of Physics.
3.	Exhibit laboratory skills learnt that enabled them to take measurements in physics laboratory and analyze the measurements to draw valid conclusions.
4.	Establish proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
5.	Enhance their oral and written scientific communication, and will prove that they can think critically and work independently.
6.	Demonstrate an understanding of the impact of Physics and Science on society.

<b>COURSE TITLE</b>	<b>MAJOR CORE: PROPERTIES OF MATTER AND SOUND</b>		
<b>CODE</b>	<b>19PH/MC/PS14</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	Describe and explain the properties and behavior of liquids and solids	PSLO'S 1, 2,3	U, An, Ap
2.	Identify various properties responsible for their behavior	PSLO'S 1, 2	U, An
3.	Understand the basic principles of Ultrasonics and Acoustics	PSLO'S 1, 2, 3	U, An, Ap
4.	Describe the production and propagation of sound	PSLO'S 5,6	U, Ap
5.	Visualize wave motion and develop intuition about waves	PSLO'S 5,6	U, Ap, An

COURSE TITLE	ALLIED CORE: PHYSICS FOR MATHEMATICS I		
CODE	<b>19PH/AC/PM13</b>		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Identify various properties responsible for their behavior	PSLO 1, 3, 6	R, U, An
2.	Understand the concept of elasticity and identify the materials suitable for a particular application	PSLO 1, 2, 3, 6	U, AP, An
3.	Apply the concepts of forces existing	PSLO 1, 6	Ap, An, C
4.	Apply Lagrangian equation to solve complex problems	PSLO 2, 4, 5	An, E
5.	Understand the fundamental concepts of the theory of relativity.	PSLO 1, 4	R, U, An

COURSE TITLE	MAJOR CORE: THERMAL PHYSICS AND STATISTICAL MECHANICS		
CODE	<b>19PH/MC/TS23</b>		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Understand laws of Thermodynamics both from microscopic and macroscopic point of view.	PSLOs 1,6	U, An, Ap
2.	Visualize real physical systems and processes by applying laws of thermodynamics	PSLOs 1,6	U, An, Ap
3.	Develop a working knowledge of thermal physics and to use this knowledge to explore various applications	PSLOs 1, 3, 6	U, Ap, C
4.	Give an account of the theory of statistical mechanics	PSLOs 1, 2, 6	R, U
5.	Show an analytic ability to solve problems related to statistical mechanics	PSLOs 1, 2, 6	An, E, Ap

COURSE TITLE	MAJOR CORE: MECHANICS		
CODE	<b>19PH/MC/ME24</b>		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level

1.	Have a basic understanding of the laws and principles of mechanics	PSLOs 1, 6	U, Ap
2.	Apply the concepts of forces existing in the system	PSLOs 2, 3	Ap, An
3.	Understand the forces of physics in everyday life	PSLOs 5, 6	U, Ap
4.	Visualize the conservation laws	PSLOs 3,4	An, E
5.	Apply Lagrangian equation to solve complex problems	PSLOs 2	Ap, An

<b>COURSE TITLE</b>	<b>MAJOR CORE: PHYSICS FOR MATHEMATICS II</b>		
<b>CODE</b>	<b>19PH/AC/PM23</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	Understand the basics of various phenomena in geometrical and wave optics	PSLO'S 1, 2	U, An
2.	Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life.	PSLO'S 1, 2	U, Ap, An
3.	They will understand the theoretical and experimental background of Electricity and Magnetism and will appreciate their general significance and applications.	PSLO'S 1, 2,	U, Ap, An
4.	Will be able to understand the working of digital circuits.	PSLO'S 2,3	U, Ap, An
5.	To understand the basic principles of operational amplifier	PSLO'S 2,3	U, Ap, An

COURSE TITLE	MAJOR CORE: ELECTRONICS I		
CODE	19PH/MC/EL33		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Explain fundamental concepts of decimal number systems and represent them in powers of the base	PSLO 1 PSLO 2 PSLO 6	R, U, An
2.	Understand the implementation of Boolean Algebra to circuits	PSLO1 PSLO 2 PSLO 3 PSLO 5 PSLO 6	R, U, AP, An, C
3.	Identify almost all electronic components and their working principles	PSLO 1 PSLO 3 PSLO 6	U, Ap, An, C
4.	Explain basic circuit concepts and responses	PSLO 1 PSLO2 PSLO 3 PSLO 4 PSLO 6	R,U, AP,An, E
5.	Describe the working of few special purpose diodes	PSLO 1 PSLO3 PSLO 6	R, U, AP,C

COURSE TITLE	MAJOR CORE: OPTICS		
CODE	19PH/MC/OP34		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Understand the basics of various phenomena in geometrical and wave optics	PSLOs 1,2	U, An
2.	Explain the behaviour of light in different mediums	PSLOs 1,3	U, Ap, An
3.	Understand the differences in the important phenomena namely interference, diffraction	PSLOs 3,4	U, An
4.	Understand the design of optical systems and methods to minimis aberrations	PSLOs 4,5	An, C
5.	Solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations	PSLOs 2,6	Ap, An

COURSE TITLE	ALLIED CORE: PHYSICS FOR CHEMISTRY I		
CODE	19PH/AC/PC33		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Identify various properties responsible for their behavior	PSLO 1 PSLO 3 PSLO 6	R, U, An
2.	Apply the concepts of forces existing	PSLO 1 PSLO2 PSLO 6	U, Ap, An, C
3.	Understand the basics of various phenomena in geometrical and wave optics.	PSLO 1 PSLO 2 PSLO 3 PSLO 6	R, U, AP, AN, C
4.	Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life	PSLO 1 PSLO 2 PSLO 3 PSLO 6	U, AP, An, C
5.	Describe the basic concepts of the theory of relativity.	PSLO 1 PSLO 6	R, U, An

COURSE TITLE	MAJOR CORE: MATHEMATICAL PHYSICS		
CODE	19PH/MC/MP44		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Acquire advanced general knowledge in Mathematics and Physics, and apply the specialized knowledge in specific areas.	PSLOs 1,2	U, An
2.	Appreciate practice of relevant mathematical methods to understand concepts in Physics	PSLOs 2,3	U, Ap, An
3.	Demonstrate accurate and efficient use of specific mathematical physics techniques	PSLOs 2,4	An, Ap
4.	Solve problems using mathematical methods	PSLOs 2,5	An, Ap
5.	Describe the significance of mathematical methods in modern physics	PSLOs 2,6	Ap, C

COURSE TITLE	ALLIED CORE: PHYSICS FOR CHEMISTRY II		
CODE	19PH/AC/PC43		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Understand the theoretical and experimental background of electricity and magnetism and will appreciate their general significance and applications	PSLO 1, 2	R, U, Ap
2.	Understand the working of digital circuits	PSLO 1, 4, 6	U, AP, An
3.	To understand the basic principles of operational amplifier	PSLO 1, 3, 6	Ap, An, E
4.	To understand the basic principles of laser	PSLO 1, 2, 5	U, R, Ap,
5.	Implement Boolean algebra into circuits	PSLO 1, 2, 6	U, An, C

COURSE TITLE	MAJOR CORE: MICROPROCESSORS AND MICROCONTROLLERS		
CODE	19PH/MC/MM53		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Analyze the architecture of 8085 and 8051	PSLOs 3, 4, 6	U, An, Ap
2.	Understand the concept of embedded system	PSLO 6	R, U
3.	Distinguish and analyze the properties of microprocessors and microcontrollers	PSLOs 6	U, An
4.	Understand the instruction set and write programs for basic arithmetic operations	PSLOs 3, 4	Ap, C
5.	Describe the application of the microprocessor and microcontroller in electronic devices.	PSLOs 6	U, Ap

COURSE TITLE	MAJOR CORE: SOLID STATE PHYSICS		
CODE	19PH/MC/SS54		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Explain mechanical properties of solids and connect these to the type of bonding in them	PSLOs 1, 6	R, U, An
2.	Employ the classical and quantum mechanical theories needed to understand the physical properties of solids.	PSLOs 1, 6	U, An, Ap
3.	Appreciate the physics of metals, semiconductors and insulators.	PSLOs 1, 3, 6	U, An, Ap
4.	Understand the impact of crystal imperfections on the properties of solids	PSLOs 1, 6	U, Ap

5.	Explain simple theories for conduction of heat and electrical current in metals	PSLOs 1, 3, 6	U, An, Ap
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<b>COURSE TITLE</b>	<b>MAJOR CORE: ELECTROMAGNETISM</b>		
<b>CODE</b>	<b>19PH/MC/EM54</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	Understand the theoretical and experimental background of Electricity and magnetism	PSLOs 1, 3, 6	U, An, Ap
2.	Appreciate their general significance and applications.	PSLOs 1, 3, 6	U, An, Ap, C
3.	Explain natural physical processes and related technological advances by applying the knowledge of electricity and magnetism.	PSLOs 1, 3, 6	U, An, Ap, C
4.	Calculate the electric field, force, potential for various charge distributions	PSLOs 1, 2	U, An, Ap, E
5.	Apply Maxwell's equations for electromagnetic wave propagation	PSLOs 1, 2	U, An, Ap, E

<b>COURSE TITLE</b>	<b>INTERDISCIPLINARY CORE: RENEWABLE ENERGY AND ENERGY ECONOMICS</b>		
<b>CODE</b>	<b>19ID/IC/RE55</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	To understand the importance of renewable energy with special reference to solar and wind energy	PSLOs 1,6	U, An
2.	To understand various concepts in utilization of Solar energy	PSLOs 1,6	U, An, Ap
3.	To acquire knowledge about the principle of wind energy production	PSLOs 1,6	U, An
4.	To study the consumer and producer preference for renewable energy	PSLOs 1,6	U, An, E
5.	To understand and evaluate the energy policies adopted in India.	PSLOs 1,6	U, An, E



<b>COURSE TITLE</b>	<b>MAJOR CORE: ELECTRONICS II</b>		
<b>CODE</b>	<b>19PH/MC/EL63</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	Apply circuit theory to analyze the electronic circuits	PSLO 1, 3	U, Ap, An
2.	Analyze A/D and D/A conversion methods	PSLO 2, 4, 6	An, E
3.	Explain the functioning of solid state devices including unijunction transistor and field effect transistor	PSLO 1, 2	R, U, Ap
4.	Understand and analyze the methods of transistor biasing	PSLO 1, 3, 4	U, An, E
5.	Have a knowledge of implementing operational amplifiers in various digital applications	PSLO 2, 3, 5	U, An, C

<b>COURSE TITLE</b>	<b>MAJOR CORE: ATOMIC AND NUCLEAR PHYSICS</b>		
<b>CODE</b>	<b>19PH/MC/AN64</b>		
<b>CLO NO.</b>	<b>COURSE LEARNING OUTCOMES</b>	<b>PSLOs Addressed</b>	<b>Cognitive Level</b>
1.	Understand the properties of the nucleus	PSLOs 1,6	R, U
2.	Appreciate the various significant processes in nucleus and its behavior	PSLOs 1,6	R, U, An
3.	Explore the interaction between subatomic particles	PSLOs 1,6	R, U, An
4.	Understand the theoretical aspect of the nuclear fusion and fission process	PSLOs 1,6	R, U, An
5.	Acquire knowledge and understand about the electronic and nuclear structure of atoms	PSLOs 1,6	R, U, An

COURSE TITLE	MAJOR CORE: QUANTUM MECHANICS		
CODE	19PH/MC/QR64		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Perform calculations using the Lorentz transformation formulae and define the notion of an inertial frame and the concept of an observer.	PSLO 1, 6	R, U, An
2.	State the principles of Special Relativity and use them to derive time dilation and length contraction.	PSLO 1, 6	U, AP, An
3.	Define relativistic energy and momentum, and use these to solve problems in mechanics.	PSLO 1, 6	Ap, An, C
4.	Use the ideas of a wave-particle duality and the uncertainty principle to solve problems in quantum mechanics.	PSLO 1, 2	R, U, AP, AN
5.	Perform calculations using the quantum wave function of a particle moving in one dimension, including making use of the momentum operator.	PSLO 1, 2	R, U, An

COURSE TITLE	MAJOR ELECTIVE: LASER PHYSICS		
CODE	19PH/ME/LP45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Understand light matter interaction	PSLOs 1,6	U, An
2.	Understand the basic principle and operation of a Laser	PSLOs 1,3, 6	U, An
3.	Differentiate various types of lasers and their means of excitation	PSLOs 1,3,6	U, An
4.	Identify the various types of Lasers	PSLOs 1,6	U, An, Ap
5.	Appreciate the usage of Lasers in fields like Medicine, Industry, Defence etc.	PSLOs 1,6	U, An, Ap

COURSE TITLE	MAJOR ELECTIVE: COMMUNICATION SYSTEMS		
CODE	19PH/MC/CS45		

CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Understand basics elements of communication systems	PSLOs 1, 6	U, An
2.	Analyze the various types of modulation principles	PSLOs 1, 6	U, An
3.	Apply the concepts of communication techniques to various modes of communication	PSLOs 1, 6	U, An, Ap
4.	Demonstrate understanding of various modulation and demodulation techniques	PSLOs 1, 6	U, An
5.	Recognize and classify the structures of optical fibre	PSLOs 1, 6	U, An, Ap

COURSE TITLE	MAJOR ELECTIVE: SPECTROSCOPY		
CODE	19PH/MC/SP45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Have knowledge about interactions of electromagnetic radiation and matter	PSLOs 1,6	U, An
2.	Understand the various spectroscopic techniques	PSLOs 1,3,6	U, An, Ap
3.	Explain the basic science behind the Microwave, Infrared and Raman spectroscopic techniques	PSLOs 1,6	U, An, Ap
4.	Show an ability to select a suitable characterization technique for their research	PSLOs 1,3, 6	U, An, Ap
5.	Describe the basic concepts related to Nuclear Magnetic Resonance	PSLOs 1,6	U, An, Ap

COURSE TITLE	MAJOR CORE: ESSENTIALS OF NANOSCIENCE		
CODE	19PH/ME/EN45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	Apply optical properties of materials at nano scale and analyze the synthesis techniques	PSLO 1, 3, 6	R, U, AP,E,C
2.	Analyze various characterization techniques	PSLO 1, 3, 6	U, AP, An, E
3.	Discern the basic knowledge of nanomaterials to technological applications	PSLO 1, 4, 6	Ap, An, C
4.	Implement the synthesis techniques in tailoring of nanomaterials	PSLO 1, 4	U, AP, An, E, C
5.	Describe the basic science behind the properties of materials at the nanometer scale	PSLO 1, 4, 6	R, U, An

**KEY: R- Remember, U- Understand, Ap – Apply, An – Analyse, E- Evaluate, C- Create**