



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

**DEPARTMENT OF PHYSICS**

**Programme Learning Outcomes/Intended 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.

**At the end of an undergraduate programme students will be able to**

- Describe and define critical concepts in their discipline
- Explain and discuss concepts and ideas pertaining to their discipline
- Demonstrate a broad understanding of their discipline
- Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
- Demonstrate understanding of the interconnections of knowledge within and across disciplines
- Apply knowledge, theories, methods, and practices in their chosen field of study to address real-world challenges and opportunities
- Demonstrate proficiency in experimental techniques and methods of analysis appropriate for their area of specialisation
- Generate and analyse data using appropriate quantitative tools
- Construct and test hypotheses
- Demonstrate cognitive and technical skills to synthesise knowledge in interrelated disciplines
- Demonstrate critical thinking and judgement in identifying and solving problems with intellectual independence
- Demonstrate the skills needed to be able to function successfully in their field
- Show responsibility and understanding of local and global issues
- Demonstrate through their actions and speech that they are agents of social justice and change
- Practice the discipline's code of ethics in their academic, professional and personal lives
- Practice the values of democracy and principles of human rights
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Demonstrate intercultural, interracial, interclass, inter-caste, and ethical competency
- Exhibit the ability to work in teams

- Exhibit a strong sense of professionalism in a range of contexts
- Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities.

### PROGRAMME SPECIFIC LEARNING OUTCOMES

On completion of this programme, students will be able to

- Acquire an understanding of core knowledge in Physics, including the major premises of Classical Mechanics, Electricity and Magnetism and Modern Physics.
- Develop proficiency in mathematics and the mathematical concepts needed for a proper understanding of Physics.
- Exhibit laboratory skills learnt that enabled them to take measurements in physics laboratory and analyze the measurements to draw valid conclusions.
- Establish proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
- Enhance their oral and written scientific communication, and will prove that they can think critically and work independently.
- Demonstrate an understanding of the impact of Physics and Science on society.

### STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

#### B.Sc. DEGREE : BRANCH III - PHYSICS

#### COURSES OF STUDY

(Effective from the academic year 2019 - 2020)

#### CHOICE BASED CREDIT SYSTEM

Subject Code	Title of Course	Credits	Total Hours			Exam Hours	Marks		
			Lecture Hours (L)	Tutorial Hours (T)	Practical Hours (P)		Continuous Assessment	End Semester	Maximum
<b>Semester - I</b>									
19PH/MC/PS14	Properties of Matter and Sound	4	4	1	0	3	50	50	100
19PH/MC/P112	Experimental Physics I	2	0	0	3	3	50	50	100
19PH/SS/HC13	Life Skills: Health, Energy and Computer Basics	3	3	0	0	-	50	-	100

<b>Allied Core Offered to the Department of Mathematics</b>										
19PH/AC/PM13	Physics for Mathematics I	3	3	0	0	3	50	50	10	0
19PH/AC/P112	Physics Practicals - I	2	0	0	3	3	50	50	10	0
	Life Skills: Personality Development (EL)	3	3	0	0	-	50	-	10	0
CD/ET/SC	Value Education	2	2	0	0	-	50	-	10	0
<b>Semester - II</b>										
19PH/MC/TS23	Thermal Physics and Statistical Mechanics	3	3	1	0	3	50	50	10	0
19PH/MC/ME24	Mechanics	4	4	1	0	3	50	50	10	0
19PH/MC/P222	Experimental Physics II	2	0	0	3	3	50	50	10	0
19PH/GC/ES12	Environmental Studies	2	2	0	0	-	50	-	10	0
<b>Allied Core Offered to the Department of Mathematics</b>										
19PH/AC/PM23	Physics for Mathematics II	3	3	0	0	3	50	50	10	0
19PH/AC/P222	Physics Practical II	2	0	0	3	3	50	50	10	0
	Basic Tamil I/General Elective I	2	2	0	0	-	50	-	10	0
<b>Semester - III</b>										
19PH/MC/EL33	Electronics I	3	3	1	0	3	50	50	10	0
19PH/MC/OP34	Optics	4	4	1	0	3	50	50	10	0
19PH/MC/P332	Experimental Physics III	2	0	0	3	3	50	50	10	0
<b>Allied Core Offered to the Department of Chemistry</b>										
19PH/AC/PC33	Physics for Chemistry I	3	3	0	0	3	50	50	10	0
19PH/AC/P132	Physics Practical I	2	0	0	3	3	50	50	10	0
CD/ET/SC	Value Education	2	2	0	0	-	50	-	10	0
	Basic Tamil II/General Elective II	2	2	0	0	-	50	-	10	0
<b>Semester - IV</b>										
19PH/MC/MP44	Mathematical Physics	4	4	1	0	3	50	50	10	0
19PH/MC/P442	Experimental Physics IV	2	0	0	3	3	50	50	10	0
<b>Allied Core Offered to the Department of Chemistry</b>										
19PH/AC/PC43	Physics for Chemistry II	3	3	0	0	3	50	50	10	0

19PH/AC/P242	Physics Practical II	2	0	0	3	3	50	50	10
19PH/SS/PS13	Life Skills: Personal and Social	3	3	0	0	-	50	-	10
	Major Elective I								0
<b>Semester - V</b>									
19PH/MC/MM53	Microprocessors and Microcontrollers	3	3	1	0	3	50	50	10
19PH/MC/SS54	Solid State Physics	4	4	1	0	3	50	50	10
19PH/MC/EM54	Electromagnetism	4	4	1	0	3	50	50	10
19PH/MC/P552	Experimental Physics V	2	0	0	3	3	50	50	10
19PH/MC/P652	Experimental Physics VI	2	0	0	3	3	50	50	10
<b>Inter Disciplinary Core Courses (PH and EC) to students of Physics and Economics</b>									
19ID/IC/RE55	Renewable Energy and Energy Economics	5	5	1	0	3	50	50	10
	General Elective III	2	2	0	0	-	50	-	10
	SAP/SL	2	2	0	0	-	50	-	10
<b>Semester - VI</b>									
19PH/MC/EL63	Electronics II	3	3	1	0	3	50	50	10
19PH/MC/AN64	Atomic and Nuclear Physics	4	4	1	0	3	50	50	10
19PH/MC/QR64	Quantum Mechanics and Relativity	4	4	1	0	3	50	50	10
19PH/MC/P762	Experimental Physics VII	2	0	0	3	3	50	50	10
19PH/MC/P862	Experimental Physics VIII	2	0	0	3	3	50	50	10
19VE/SS/HL63	Life Skills: An Approach to a Holistic Way of Life	3	3	0	0	-	50	-	10
	Major Elective II								0
	General Elective IV	2	2	0	0	-	50	-	10
<b>Major Elective Courses</b>									
19PH/ME/EN45	Essentials of Nanoscience	5	4	1	0	3	50	50	10
19PH/ME/LP45	Laser Physics	5	4	1	0	3	50	50	10
19PH/ME/CS45	Communication Systems	5	4	1	0	3	50	50	10
19PH/ME/SP45	Spectroscopy	5	4	1	0	3	50	50	10
19PH/ME/PR45	Project	5	0	0	5	-	50	50	10
<b>General Elective Courses</b>									

19PH/GE/BP22	Basic Principles of Physics	2	1	0	1	-	50	0	10
19PH/GE/HE22	Home Electrical Installations	2	1	0	1	-	50	0	10
19PH/GE/EP22	Energy Physics	2	1	0	1	-	50	0	10
19PH/GE/WL22	Wireless Communication	2	1	0	1	-	50	0	10
<b>Independent Elective Courses</b>									
19PH/UI/GP23	Geophysics	3	0	0	0	3	-	10	10
19PH/UI/GP23	Geophysics	3	0	0	0	3	-	10	10

### **PROPERTIES OF MATTER AND SOUND**

**CODE:19PH/MC/PS14**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To develop in students a theoretical understanding of properties of matter
- To enable the students to understand the fundamental concepts of atomic physics and its application in various fields

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Describe and explain the properties and behavior of liquids and solids
- Identify various properties responsible for their behavior
- Understand the basic principles of Ultrasonics and Acoustics
- Describe the production and propagation of sound
- Visualize wave motion and develop intuition about waves

### **EXPERIMENTAL PHYSICS I**

**CODE:19PH/MC/P112**

**CREDITS :2**

**L T P :0 0 3**

**TOTAL HOURS :39**

### **LIFE SKILLS – HEALTH, ENERGY AND COMPUTER BASICS**

**CODE: 19PH/SS/HC13**

**CREDITS: 3**

**L T P: 3 0 0**

**TOTAL TEACHING HOURS: 39**

#### **OBJECTIVES OF THE COURSE**

- To sensitise students to the fact that good health lies in nature
- To create an awareness about energy obtained from different components of food and to plan for a balanced diet
- To enable students to understand the significance of energy conservation and strategies for conserving energy
- To provide a basic knowledge of computer fundamentals and Email configuration

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- identify the importance of a few plants and their health benefits
- recognise the causes and symptoms of common disorders
- calculate food energy values and follow the Recommended Dietary Allowances (RDA) and appreciate the need for them.
- conserve energy and use it responsibly
- understand computer configuration for purchase of personal computer and E mail Setting

### **PHYSICS FOR MATHEMATICS I**

**CODE:19PH/AC/PM13**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVE OF THE COURSE**

- To understand the fundamental concepts of Mechanics, Properties of matter and theory of Relativity.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Identify various properties responsible for their behavior
- Understand the concept of elasticity and identify the materials suitable for a particular application
- Apply the concepts of forces existing
- Apply Lagrangian equation to solve complex problems
- Understand the fundamental concepts of the theory of relativity.

### **PHYSICS PRACTICAL I**

**CODE:19PH/AC/P112**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

### **THERMAL PHYSICS AND STATISTICAL MECHANICS**

**CODE:19PH/MC/TS23**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

**OBJECTIVES OF THE COURSE**

- To understand the concepts of heat and temperature
- To apply thermodynamic relations to problem solving

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand laws of Thermodynamics both from microscopic and macroscopic point of view.
- Visualize real physical systems and processes by applying laws of thermodynamics.
- Develop a working knowledge of thermal physics and to use this knowledge to explore various applications
- Give an account of the theory of statistical mechanics
- Show an analytic ability to solve problems related to statistical mechanics

**MECHANICS**

**CODE:19PH/MC/ME24**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To understand physical laws and concepts of static and dynamic bodies
- To introduce the idea of Lagrangian Mechanics

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Have a basic understanding of the laws and principles of mechanics
- Apply the concepts of forces existing in the system
- Understand the forces of physics in everyday life
- Visualize the conservation laws
- Apply Lagrangian equation to solve complex problems

**EXPERIMENTAL PHYSICS II**

**CODE:19PH/MC/P222**

**CREDITS :2**

**L T P :0 0 3**

**TOTAL HOURS :39**

**ENVIRONMENTAL STUDIES**

**CODE:19PH/GC/ES12**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

### **OBJECTIVES OF THE COURSE**

- To help students to gain the fundamental knowledge of the environment
- To create in students an awareness of current environmental issues
- To inculcate in students an eco-sensitive, eco-conscious and eco-friendly attitude

### **COURSE LEARNING OUTCOMES**

On successful completion of this course, students will be able to

- Articulate the interdisciplinary context of environmental issues
- Adopt sustainable alternatives that integrate science, humanities and social perspectives
- Appreciate the importance of biodiversity and a balanced ecosystem
- Calculate one's carbon footprint

## **PHYSICS FOR MATHEMATICS II**

**CODE:19PH/AC/PM23**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

### **OBJECTIVES OF THE COURSE**

- To understand the principles of Electricity and Magnetism
- To introduce fundamental concepts of Optics and Electronics

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the basics of various phenomena in geometrical and wave optics
- Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life.
- They will understand the theoretical and experimental background of Electricity and magnetism and will appreciate their general significance and applications.
- Will be able to understand the working of digital circuits.
- To understand the basic principles of operational amplifier

## **PHYSICS PRACTICAL II**

**CODE:19PH/AC/P222**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**



## **ELECTRONICS I**

**CODE:19PH/MC/EL33**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

### **OBJECTIVES OF THE COURSE**

- To understand the concept of digital principles as applied to microprocessors and computers
- To develop knowledge in combinational logic and sequential logic circuits and their Applications

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain fundamental concepts of decimal number systems and represent them in powers of the base
- Understand the implementation of Boolean Algebra to circuits
- Identify almost all electronic components and their working principles
- Explain basic circuit concepts and responses
- Describe the working of few special purpose diodes

## **OPTICS**

**CODE:19PH/MC/OP34**

**CREDITS:4**

**L T P:4 1 0**

**TOTALTEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To expose the students to the fundamentals of optics.
- To provide the students a clear idea about the applications of optics.

### **OUTCOME OF THE COURSE**

On successful completion of the course, students will be able to

- Understand the basics of various phenomena in geometrical and wave optics
- Explain the behavior of light in different mediums
- Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life.
- Understand the design of optical systems and methods to minimis aberrations
- Solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations

## **EXPERIMENTAL PHYSICS III**

**CODE:19PH/MC/P332**

**CREDITS :2**  
**L T P :0 0 3**  
**TOTAL HOURS :39**

### **PHYSICS FOR CHEMISTRY I**

**CODE:19PH/AC/PC33**  
**CREDITS:3**  
**LTP:3 0 0**  
**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To acquaint students with the fundamental laws and principles of physics
- To familiarise students with developments in modern optics

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- To identify various properties of matter, responsible for their behavior
- To apply the concepts of forces existing
- Understand the basics of various phenomena in geometrical and wave optics
- Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life.
- Describe the basic concepts of the theory of Relativity

### **PHYSICS PRACTICAL I**

**CODE:19PH/AC/P132**  
**CREDITS:2**  
**L T P:0 0 3**  
**TOTAL HOURS:39**

### **MATHEMATICAL PHYSICS**

**CODE:19PH/MC/MP44**  
**CREDITS:4**  
**L T P:4 1 0**  
**TOTAL TEACHING HOURS:52**

#### **OBJECTIVES OF THE COURSE**

- To enable students to learn various mathematical techniques
- To facilitate the applications of these techniques to physical problems

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Acquire advanced general knowledge in Mathematics and Physics, and apply the specialized knowledge in specific areas.
- Appreciate practice of relevant mathematical methods to understand concepts in Physics

- Demonstrate accurate and efficient use of specific mathematical physics techniques
- Solve problems using mathematical methods
- Describe the significance of mathematical methods in modern physics

#### **EXPERIMENTAL PHYSICS IV**

**CODE:19PH/MC/P442**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

#### **PHYSICS FOR CHEMISTRY II**

**CODE:19PH/AC/PC43**

**CREDITS:3**

**LTP:3 0 0**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To understand the basic concepts of electricity and magnetism
- To familiarise students with developments in modern physics and electronics

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the theoretical and experimental background of Electricity and magnetism and will appreciate their general significance and applications.
- Understand the working of digital circuits.
- To understand the basic principles of operational amplifier.
- To understand the basic principles of Laser
- Implement Boolean algebra into circuits.

#### **PHYSICS PRACTICAL II**

**CODE:19PH/AC/P242**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

#### **LIFE SKILLS: PERSONAL AND SOCIAL**

**CODE: 19PH/SS/PS13**

**CREDITS: 3**

**L T P: 3 0 0**

**TOTAL TEACHING HOURS: 39**

#### **OBJECTIVES OF THE COURSE**

- To enable students to understand the working of Indian Governance and laws
- To empower students as citizens by teaching them how to use the RTI, the PIL and

the FIR

- To provide students an insight into the strengths and virtues essential to improve wellbeing
- To bring about awareness of societal dynamics
- To create awareness, impart knowledge and hone skills necessary to make sound financial decisions

### **COURSE LEARNING OUTCOMES**

On successful completion of this course, students will be able to

- demonstrate knowledge of the working of the government
- file RTIs, PILs and FIRs
- improve their quality of life
- exhibit social consciousness
- exhibit prudent behaviour in managing personal finance

### **MICROPROCESSORS AND MICROCONTROLLERS**

**CODE:19PH/MC/MM53**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

### **OBJECTIVES OF THE COURSE**

- To understand the architecture of microprocessor 8085
- To develop programming skills for writing assembly languages for microprocessor 8085
- To learn the basic concepts of microcontroller 8051

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Analyze the architecture of 8085 and 8051
- Understand the concept of embedded system
- Distinguish and analyze the properties of microprocessors and microcontrollers
- Understand the instruction set and write programs for basic arithmetic operations
- Describe the application of the microprocessor and microcontroller in electronic devices.

### **SOLID STATE PHYSICS**

**CODE :19PH/MC/SS54**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To study crystal bonding and imperfections in crystals

- To learn the properties of solids

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain mechanical properties of solids and connect these to the type of bonding in them.
- Employ the classical and quantum mechanical theories needed to understand the physical properties of solids.
- Appreciate the physics of metals, semiconductors and insulators.
- Understand the impact of crystal imperfections on the properties of solids
- Explain simple theories for conduction of heat and electrical current in metals

## **ELECTROMAGNETISM**

**CODE:19PH/MC/EM54**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS 65**

### **OBJECTIVES OF THE COURSE**

- To enable students to understand the fundamental concepts of classical electromagnetic theory
- To understand the complementary nature of electric and magnetic phenomena

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the theoretical and experimental background of Electricity and magnetism
- Appreciate their general significance and applications.
- Explain natural physical processes and related technological advances by applying the knowledge of electricity and magnetism.
- Calculate the electric field, force, potential for various charge distributions
- Apply Maxwell's equations for electromagnetic wave propagation

## **EXPERIMENTAL PHYSICS V**

**CODE:19PH/MC/P552**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

## **EXPERIMENTAL PHYSICS VI**

**CODE:19PH/MC/P652**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

## **RENEWABLE ENERGY AND ENERGY ECONOMICS**

**CODE: 19ID/IC/RE55**

**CREDITS:5**

**L T P:5 1 0**

**TOTAL TEACHING HOURS:78**

### **OBJECTIVES OF THE COURSE**

- To understand the importance of renewable energy with special reference to solar and wind energy
- To understand various concepts in utilization of Solar energy
- To acquire knowledge about the principle of wind energy production
- To study the consumer and producer preference for renewable energy
- To understand and evaluate the energy policies adopted in India.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- To analyze solar radiation on earth's surface
- To evaluate the wind energy production at a site
- Evaluate the demand and supply of renewable energy
- To calculate the cost and benefits of alternative energy
- To critically analysis the energy policies adopted in India

## **ELECTRONICS II**

**CODE:19PH/MC/EL63**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

### **OBJECTIVES OF THE COURSE**

- To study the design and applications of amplifiers
- To understand the basic principles of operational amplifier

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Apply circuit theory to analyze the electronic circuits
- Analyze A/D and D/A conversion methods
- Explain the functioning of solid state devices including unijunction transistor and field effect transistor
- Understand and analyze the methods of transistor biasing
- Have a knowledge of implementing operational amplifiers in various digital applications

## **ATOMIC AND NUCLEAR PHYSICS**

**CODE:19PH/MC/AN64**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To learn the fundamental concepts of nuclear physics
- To acquaint students with the phenomenon of radioactivity, nuclear energy and elementary Particles

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the properties of the nucleus
- Appreciate the various significant processes in nucleus and its behavior
- Explore the interaction between subatomic particles
- Understand the theoretical aspect of the nuclear fusion and fission process
- Acquire knowledge and understand about the electronic and nuclear structure of atoms

## **QUANTUM MECHANICS AND RELATIVITY**

**CODE:19PH/MC/QR64**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To introduce the basic concepts and fundamental phenomena of quantum physics
- To understand the relationship between space and time, mass and energy.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Perform calculations using the Lorentz transformation formulae and define the notion of an inertial frame and the concept of an observer.
- State the principles of Special Relativity and use them to derive time dilation and length contraction.
- Define relativistic energy and momentum, and use these to solve problems in mechanics.
- Use the ideas of a wave-particle duality and the uncertainty principle to solve problems in quantum mechanics.
- Perform calculations using the quantum wave function of a particle moving in one dimension, including making use of the momentum operator.

### **EXPERIMENTAL PHYSICS VII**

**CODE:19PH/MC/P762**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

### **EXPERIMENTAL PHYSICS – VIII**

**CODE:19PH/MC/P862**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

### **LIFE SKILLS : AN APPROACH TO A HOLISTIC WAY OF LIFE**

**CODE:19VE/SS/HL63**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To help students grow in spirituality and to experience themselves as integrated persons
- To help students understand themselves as relational beings and appreciate their role in family and society
- To help students recognize the commonality and differences of the different religions in India
- To help students grow in an awareness of the protective laws regarding women
- To prepare students to make informed choices in family and career

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Appreciate themselves as integrated persons
- Recognize their role in family and society and become aware of the different protective laws in favour of women
- Make prudent choices for career and family
- Manage work life balance
- Live a harmonious life and be a channel of peace

### **ESSENTIALS OF NANOSCIENCE**

**CODE:19PH/ME/EN45**

**CREDITS:5**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**



- To introduce the students to the developing field of nanoscience and technology
- To understand the methods of synthesis, characterization techniques and applications of Nanomaterials

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Apply optical properties of materials at nano scale and analyze the synthesis techniques
- Analyze various characterization techniques
- Discern the basic knowledge of nanomaterials to technological applications
- Implement the synthesis techniques in tailoring of nanomaterials
- Describe the basic science behind the properties of materials at the nanometer scale

## **LASER PHYSICS**

**CODE:19PH/ME/LP45**

**CREDITS :5**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To study the principles of Laser
- To acquaint student with different types of Lasers and their applications

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand light matter interaction
- Understand the basic principle and operation of a Laser
- Differentiate various types of lasers and their means of excitation
- Identify the various types of Lasers
- Appreciate the usage of Lasers in fields like Medicine, Industry, Defence etc.

## **COMMUNICATION SYSTEMS**

**CODE:19PH/ME/CS45**

**CREDITS:5**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To acquaint students with concepts of communication systems
- To understand the principles of optical and mobile communication systems

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand basics elements of communication systems
- Analyze the various types of modulation principles
- Apply the concepts of communication techniques to various modes of communication
- Demonstrate understanding of various modulation and demodulation techniques
- Recognize and classify the structures of optical fibre

### **SPECTROSCOPY**

**CODE:19PH/ME/SP45**

**CREDITS:5**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To expose the students to the basic principles of spectroscopy
- To provide an idea about instrumentation and the applications of spectroscopy

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Have knowledge about interactions of electromagnetic radiation and matter
- Understand the various spectroscopic techniques
- Explain the basic science behind the Microwave, Infrared and Raman spectroscopic techniques
- Show an ability to select a suitable characterization technique for their research
- Describe the basic concepts related to Nuclear Magnetic Resonance

### **PROJECT**

**CODE:19PH/ME/PR45**

**CREDITS:5**

### **BASIC PRINCIPLES OF PHYSICS**

**CODE:19PH/GE/BP22**

**CREDITS:2**

**L T P:1 0 1**

**TOTAL TEACHING HOURS:26**

#### **OBJECTIVES OF THE COURSE**

- To learn the basic concepts of physics
- To understand the principles of various machines through experiments

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Demonstrate conceptual understanding of the fundamental Physics principles.

- Explain the behavior of light in different mediums
- Understand the basic concepts of Current, Electricity and Voltage.
- Apply the basics laws of mechanics to understand the working of simple machines.
- Appreciate the usage of the basic concepts of Physics in everyday life.

### **HOME ELECTRICAL INSTALLATIONS**

**CODE:19PH/GE/HE22**

**CREDITS:2**

**L T P:1 0 1**

**TOTAL TEACHING HOURS:26**

#### **OBJECTIVES OF THE COURSE**

- To understand the working principles of domestic electrical appliances
- To gain the ability to carry out simple electrical repair works

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the basic concepts of Current, Electricity and Voltage.
- Understand the working and usage of basic circuit components in circuits.
- Implement various safety measures and precautions when handling electrical appliances
- Have a knowledge of the working principles of few home electrical appliances
- Make comprehensive use of the technical knowledge gained from hands on training to undertake simple electrical repair works.

### **ENERGY PHYSICS**

**CODE:19PH/GE/EP22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

#### **OBJECTIVES OF THE COURSE**

- To understand various types of energy
- To stress the importance of conservation of energy and the need for alternate source of Energy

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Learn what energy and work mean in Physics and how they are related to each other.
- Describe the environmental impact of the fossil fuels and the need for cleaner sources of energy.

- Acquire knowledge about all proposed renewable energy technologies
- Explain the production of electricity from renewable sources of energy
- Understand and be aware of the importance of sustainable energy.

### **WIRELESS COMMUNICATION**

**CODE:19PH/GE/WL22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

#### **OBJECTIVES OF THE COURSE**

- To study the basic concepts of communication
- To understand the principles of optical and mobile Communications

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand types of propagation of electromagnetic radiation
- Understand the basics of AM and FM transmission and reception
- Describe the basics of wireless communication
- Differentiate four generations of wireless standard for cellular networks
- Acquire a basic understanding of concepts related to Bluetooth, GPS and Hotspot.

### **GEOPHYSICS**

**CODE:19PH/UI/GP23**

**CREDITS:3**

#### **OBJECTIVE OF THE COURSE**

- To learn the basics of Geophysics and the dynamics of Earth

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the structure and evolution of our planet
- Acquire knowledge on the formation of oil and gas.
- Apply physics to the study of earth
- Describe the Earth and the Universe in their generality.
- Understand the fundamentals of Seismology for the exploration of oil reservoirs.

### **ASTROPHYSICS**

**CODE:19PH/UI/AP23**

**CREDITS: 3**

#### **OBJECTIVE OF THE COURSE**

- To learn about stars and constellations

### **OUTCOME OF THE COURSE**

On completion of the course students will be able to

- Demonstrate a basic understanding of the stars, galaxies and our Universe.
- Understand the violent universe -white dwarf, neutron stars and black hole.
- Acquire knowledge about unsolved mysteries of the universe
- Understand the exoplanets in the solar system
- Describe the general observed properties of star and their formation and evolution with respect to HR diagram.

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## **STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

### **Programme Learning Outcomes/Intended Programme Learning Outcomes**

Graduates of a Master's Degree of Stella Maris College will have a comprehensive knowledge of their disciplines, with in-depth knowledge of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

#### **At the end of a postgraduate programme students will be able to**

- Demonstrate mastery in the discipline
- Demonstrate deep understanding of the broad principles of science and technology and apply them in varied contexts
- Demonstrate knowledge, understanding and professionalism required for the discipline
- Demonstrate capability to locate, evaluate, manage, and use information/data and research to develop and guide their own knowledge, learning, and practice
- Demonstrate the ability to organise a presentation in a coherent fashion
- Demonstrate the literacy and numeracy skills necessary to understand and interpret information/data and communicate according to the context
- Draw on multiple, relevant/interrelated fields of study to understand, analyse and solve problems
- Exhibit principled decision making and reasoning to identify creative solutions to ethical problems
- Practice/act in ways that show a commitment to social justice and the processes of peace/conflict resolution
- Demonstrate the skills to appropriately interact with people from a range of cultural, linguistic, and religious backgrounds

- Demonstrate an understanding of local, regional, national, and global issues
- Identify themselves as agents of change
- Demonstrate the ability to solve an issue
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Exhibit the ability to work in teams
- Demonstrate sensitivity and readiness to share their knowledge and capabilities with the marginalised and oppressed in their communities

### PROGRAMME SPECIFIC LEARNING OUTCOMES

On successful completion of the programme, the students will be able to

- Demonstrate conceptual understanding of physics, its models and their limitations
- Perform calculations in theoretical physics using qualitative and quantitative reasoning including sophisticated mathematical techniques
- Show the ability to follow and critically assess developments in the field of physics by using relevant physical literature and databases.
- Conduct independent research or work successfully in a technical position.
- Demonstrate the ability to critically and creatively identify and formulate problems using appropriate methods.
- Carry out advanced tasks like computations, simulations, observations and experiments in Physics.
- Communicate the critical importance of physics in the society.

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086**

**M.Sc. DEGREE : Branch III PHYSICS**

**COURSES OF STUDY**

**(Effective from the academic year 2019-2020)**

**CHOICE BASED CREDIT SYSTEM**

C-Credit, L-Lecture Hours, T-Tutorial Hours, P- Practical Hours, Ex-Exam Hours, CA- Continuous Assessment Marks, ES-End Semester Marks, M-Maximum Marks									
Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
<b>SEMESTER-I</b>									
19PH/PC/MP14	Mathematical Physics I	4	4	1	0	3	50	50	100
19PH/PC/SM14	Statistical Mechanics	4	4	1	0	3	50	50	100

19PH/PC/EL14	Electronics I	4	4	1	0	3	50	50	10 0
19PH/PC/P114	Experimental Physics I	4	0	0	8	3	50	50	10 0
	Department Elective I								
	SAP / SL	2	2	0	0	-	-	50	10 0
<b>SEMESTER-II</b>									
19PH/PC/MP24	Mathematical Physics II	4	4	1	0	3	50	50	10 0
19PH/PC/CM24	Classical Mechanics	4	4	1	0	3	50	50	10 0
19PH/PC/P224	Experimental Physics II	4	0	0	8	3	50	50	10 0
	Department Elective II								
	Common Elective I								
CD / ET	Value Education	2	2	0	0	-	50	-	10 0
19EL/PK/SS22	Soft Skills	2	2	0	0	-	50	-	10 0
<b>SEMESTER-III</b>									
19PH/PC/QM34	Quantum Mechanics I	4	4	1	0	3	50	50	10 0
19PH/PC/SS34	Solid State Physics	4	4	1	0	3	50	50	10 0
19PH/PC/ED34	Electrodynamics	4	4	2	0	3	50	50	10 0
19PH/PC/P334	Experimental Physics III	4	0	0	8	3	50	50	10 0
	Common Elective II								
CD / ET	Value Education	2	2	0	0	-	50	-	10 0
19PH/PN/SI32	Summer Internship	2	0	0	2	-	50	-	10 0
<b>SEMESTER-IV</b>									
19PH/PC/QM44	Quantum Mechanics II	4	4	1	0	3	50	50	10 0
19PH/PC/NP44	Nuclear and Elementary Particle Physics	4	4	1	0	3	50	50	10 0
19PH/PC/EL44	Electronics II	4	4	1	0	3	50	50	10 0
19PH/PC/DS47	Dissertation	7	0	0	9	-	50	50	10 0
	Department Elective III								
<b>Postgraduate Elective Courses Offered to Parent Department</b>									

19PH/PE/CP15	Crystal Physics	5	5	0	0	3	50	50	10 0
19PH/PE/RP15	Reactor Physics	5	5	0	0	3	50	50	10 0
19PH/PE/MN15	Material Physics and Nanoscience	5	5	0	0	3	50	50	10 0
19PH/PE/MU15	Medical Physics and Ultrasonics	5	5	0	0	3	50	50	10 0
19PH/PE/AP15	Astrophysics	5	5	0	0	3	50	50	10 0
19PH/PE/GP15	Geophysics	5	5	0	0	3	50	50	10 0
19PH/PE/SP15	Spectroscopy	5	5	0	0	3	50	50	10 0
<b>Postgraduate Elective Courses Offered to Other Departments</b>									
19PH/PE/ED23	Everyday Physics	3	2	0	1	3	50	50	10 0
19PH/PE/EI23	Electrical Installations	3	2	0	1	3	50	50	10 0
19PH/PE/EP23	Energy Physics	3	3	0	0	3	50	50	10 0
<b>Independent Elective Courses</b>									
19PH/PI/DC24	Digital Communication	4	0	0	0	3	-	10 0	10 0
19PH/PI/DN24	Data Communication and Computer networks	4	0	0	0	3	-	10 0	10 0

## MATHEMATICAL PHYSICS I

**CODE:19PH/PC/MP14**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### OBJECTIVES OF THE COURSE

- The foundations to various mathematical techniques and tools like numerical methods, transform techniques and special functions which forms the back bone of all higher physics is introduced.

### COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- Explain the main mathematical methods used in physics.
- Understand the fundamentals of Numerical and Complex Analysis
- Be familiar with important special functions in mathematical physics including Legendre Polynomial and Bessel function



- Master the tools from vector and tensor analysis that are important prerequisites for other theoretical physics courses like electrodynamics or continuum mechanics.
- Demonstrate accurate and efficient use of specific mathematical physics techniques

### **STATISTICAL MECHANICS**

**CODE:19PH/PC/SM14**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To create a thorough understanding of how a real system should be understood by the linking of thermodynamics with kinetic theory using statistical methods
- To develop understanding of the importance of entropy in this linking
- To learn the concept of ensembles – tackle the simplest case of ideal gas in different ensembles
- To invoke the quantum picture, density matrix and quantum gases

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the basic ideology of phase space, microstate and macrostate
- Give an account of the relevant quantities used to describe macroscopic systems, thermodynamic potentials and ensembles.
- Apply the principles of probability in distribution of particles in various systems and to calculate thermodynamic probability.
- Distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels.
- Show an analytic ability to solve problems relevant to statistical mechanics

### **ELECTRONICS I**

**CODE:19PH/PC/EL14**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- Appreciate the significance of electronics in different applications.
- Compile the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates
- Familiarize the students with the Op-Amp IC and its applications.
- To introduce the basic architecture, operation and interfacing of microprocessors.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand operation of diodes, transistors in order to design basic circuits
- Explain the functioning of field-effect transistors.
- Demonstrate understanding of shift register basics, the various kinds, their operating characteristics, and applications.
- Write assembly language program for 8085
- Students will be able to understand various types of memory systems.

### **EXPERIMENTAL PHYSICS I**

**CODE:19PH/PC/P114**

**CREDITS:4**

**L T P:0 0 8**

**TOTAL HOURS:78**

### **MATHEMATICAL PHYSICS II**

**CODE:19PH/PC/MP24**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- Advanced mathematical tools essential for various theoretical models in all branches of physics are introduced with aim to enable students solve problems.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Express in depth understanding of the partial differential equations
- Be familiar with differential forms as tools that allow to solve physical problems with simplicity
- Acquire a basic knowledge of some advanced topics in Mathematical Physics, such as the elements of group theory
- Solve problems using special functions, such as Bessel functions and Legendre polynomials.
- Understand the applications of Fourier Transform in the field of Physics

### **CLASSICAL MECHANICS**

**CODE:19PH/PC/CM24**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To introduce the classical formulation approaches like Lagrangian and Hamiltonian

dynamics in understanding mechanical systems and solving problems.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand planar and spatial motion of a rigid body,
- Utilize appropriate mathematical tools to analyse and solve a system's equations.
- Demonstrate a basic knowledge of Lagrangian and Hamiltonian dynamics.
- Apply Lagrangian & Hamiltonian methods to complex motion problems.
- Demonstrate an understanding of the central-force motion.

### **EXPERIMENTAL PHYSICS II**

**CODE:19PH/PC/P224**

**CREDITS:4**

**L T P:0 0 8**

**TOTAL HOURS:78**

### **SOFT SKILLS**

**CODE: 19PH/PK/SS22**

**CREDITS: 2**

**L T P: 2 0 0**

**TOTAL TEACHING HOURS: 26**

### **OBJECTIVES OF THE COURSE**

- To empower students and create opportunities for self-development.
- To instill confidence in students to face challenges.
- To manage emotions and resolve conflicts.
- To organize activities and manage time.
- To set goals and plan ahead.

### **COURSE LEARNING OUTCOMES**

- Communicate with confidence and poise.
- Accept themselves and improve on their weaknesses.
- Strengthen their relationships through confronting and solving problems.
- Work more effectively and complete activities on time.
- Plan their future with clarity and focus.

### **QUANTUM MECHANICS I**

**CODE:19PH/PC/QM34**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To understand the basic concepts of quantum mechanics.
- To have an in-depth knowledge of intermediate quantum mechanics.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Demonstrate an understanding of how quantum states are described by wave functions
- Demonstrate an understanding of the significance of operators and eigenvalue problems in quantum mechanics
- Solve the Schrodinger equation and describe the properties of the simple harmonic oscillator
- Demonstrate an understanding of angular momentum in quantum mechanics
- Learn approximate methods for solving the Schrödinger equation (the variational method, perturbation theory, Born approximations)

### **SOLID STATE PHYSICS**

**CODE:19PH/PC/SS34**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To understand the properties of metals
- To learn the magnetic properties of materials

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the basics of the Free Electron model and calculate electrical and thermal properties
- Clearly describe the cause for different types of magnetism in materials
- Account for what the Fermi surface is and how it can be measured
- Describe the phenomenon of superconductivity
- Distinguish between perfect conduction and perfect diamagnetism, and give a qualitative description of the Meissner effect

### **ELECTRODYNAMICS**

**CODE:19PH/PC/ED34**

**CREDITS:4**

**L T P:4 2 0**

**TOTAL TEACHING HOURS:78**

### **OBJECTIVES OF THE COURSE**

- To study the laws governing the distribution and propagation of electromagnetic fields created by static and dynamic charge distributions and their interaction with matter.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Have a deep understanding of the theoretical foundations of electromagnetic phenomena
- Understand the usage of basic concepts of electromagnetism
- Be able to solve the Maxwell equations for simple configurations
- Describe and explain electrodynamics, and explain Maxwell's equations in vacuum;
- Show an ability to solve problems in electrodynamics

### **EXPERIMENTAL PHYSICS III**

**CODE:19PH/PC/P334**

**CREDITS:4**

**L T P:0 0 8**

**TOTAL HOURS:78**

### **SUMMER INTERNSHIP**

**CODE:19PH/PN/SI32**

**CREDITS:2**

### **OBJECTIVES OF THE COURSE**

- To familiarize the students to research ambience.
- To expose the students to various experimental and analytic techniques related to research.
- To enable the students to have a hands-on experience to work in their desired field. It will help them learn how their course of study applies to the real world and build a valuable experience that makes them stronger candidates for jobs after graduation

### **QUANTUM MECHANICS II**

**CODE:19PH/PC/QM44**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVE OF THE COURSE**

- To introduce time dependent perturbation theory, its applications
- To understand the concepts of relativity and relativity in quantum mechanics, symmetries in QM
- To introduce the concepts of quantum field theory.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Formulate and solve problems in quantum mechanics using Dirac notation
- Describe the importance of symmetry and conservation laws in quantum mechanics
- Acquire knowledge of non-relativistic and relativistic quantum mechanics including time-dependent perturbation theory, scattering theory, relativistic wave equations, and second quantization.
- Recognise the connection between relativity and quantum mechanics
- Analyse physical system in a quantum mechanical way

### **NUCLEAR AND ELEMENTARY PARTICLE PHYSICS**

**CODE:19PH/PC/NP44 CREDITS:4**

**L T P: 4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVE OF THE COURSE**

- To explore the understanding of nuclear models and various physical properties of nucleus.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Learn the concepts in particle and nuclear physics
- Explain the role of spin-orbit coupling in the shell structure of atomic nuclei, and predict the properties of nuclear ground and excited states based on the shell model
- Describe the different types of elementary particle interaction
- Explain the different forms of radioactivity and account for their occurrence
- Be familiar with current research in Nuclear Physics.

### **ELECTRONICS II**

**CODE:19PH/PC/EL44**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- Explore the architecture microcontroller 8051.
- Write assembly language program in 8086 and 8051 for various applications.
- Select a microprocessor or a microcontroller suitable for the given application.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Compare microprocessors and microcontrollers.

- Describe the architecture and instruction set of 8085 and 8051
- Understand programming and interfacing of microprocessors and microcontrollers.
- Explain the interfacing between microprocessor and various peripherals.
- Analyse the embedded system concept

### **DISSERTATION**

**CODE:19PH/PC/DS47**

**CREDITS:7**

### **CRYSTAL PHYSICS**

**CODE:19PH/PE/CP15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To know the different structures of crystals
- To understand types of characterization of crystals and its applications

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Recognize the applications of X-ray crystallography
- Understand the crystal structure and thermal properties of materials.
- Understand the influence of lattice vibrations on thermal behaviour.
- Relate crystalline structure to X-ray diffraction data and the reciprocal lattice.
- Understand the influence of crystal binding energy on crystalline structure.

### **REACTOR PHYSICS**

**CODE:19PH/PE/RP15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To expose the students to the physics of neutrons and fuel inside a reactor.
- To understand the construction of a nuclear reactor and precautions to be taken in its Operation

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Discuss the various aspects of reactor physics.
- demonstrate a knowledge of fundamental aspects of the structure of the nucleus,

radioactive decay, nuclear reactions and the interaction of radiation and matter;

- Explain processes of nuclear collisions and nuclear reactions.
- describe the physical processes as well as the different components of a nuclear power plant
- Understand important reactor parameters including performance and safety
- Acquire a clear understanding of the applications of nuclear physics

### **MATERIAL PHYSICS AND NANOSCIENCE**

**CODE:19PH/PE/MN15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To introduce the rapidly developing field of nanoscience and technology with special focus on the methods of synthesis, characterization techniques and applications of nanomaterials
- To understand the necessary concepts in nanotechnology
- To develop skills to perform their project works related to the synthesis and characterization of nanomaterials by direct experience.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the basic concepts of Nanoscience and Nanotechnology
- Give an account of the various synthesis procedures for nanofabrication
- Describe the state-of-the-art characterization methods for nanomaterials
- describe the size effects induced changes on material properties
- Exhibit a broad and coherent knowledge of nanoscale phenomena and describe how and why materials and systems at the nanoscale differ from those at macro- and micro-scales.

### **MEDICAL PHYSICS AND ULTRASONICS**

**CODE:19PH/PE/MU15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To learn the fundamentals of health Physics.
- To acquire knowledge about diagnostic and therapeutic devices.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to



- Acquire a better understanding of the importance of physics for medical diagnosis and treatment.
- Explain and describe the physical concepts for different modalities used in medical diagnosis and treatment.
- Learn how different external physical factors including ionizing radiation, electrical and magnetic fields and thermal effects influence biological systems.
- Understand the Physics of medical imaging
- Describe the application of physics principles such as ultrasound and Nuclear Magnetic Resonance

## **ASTROPHYSICS**

**CODE:19PH/PE/AP15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVES OF THE COURSE**

- To learn about stars and constellations
- To appreciate the universe.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the violent Universe -white dwarf, neutron stars and black hole.
- Explain the origin of our universe
- Describe the structure and evolution of stars
- Describe the general observed properties of star and their formation with respect to HR diagram.
- Understand the basic concepts of modern astrophysics, such as: Stellar classification and spectroscopy, solar system and planetary motion, stellar evolution and nuclear fusion etc.

## **GEOPHYSICS**

**CODE:19PH/PE/GP15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

### **OBJECTIVE OF THE COURSE**

- To provide brief introduction to seismology and to have a look at the experimental data supporting electric and magnetic properties of earth.

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the structure and evolution of the Earth
- Apply Physics to the study of the Earth
- Different techniques used to map and analyze the physical properties of the Earth.
- Understand the physical principles of reflection seismology
- Appreciate the application of geophysics for understanding the physical conditions of the Earth's multi-layered interior.

### **SPECTROSCOPY**

**CODE:19PH/PE/SP15**

**CREDITS:5**

**L T P:5 0 0**

**TOTAL TEACHING HOURS:65**

#### **OBJECTIVES OF THE COURSE**

- To have in depth understanding of various techniques of spectroscopy
- To study its applications to modern science.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Acquire an advanced knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy
- Explain the basic principles of IR, Electronic, Vibrational and Nuclear spectroscopy
- Discuss the basic components common to most spectroscopic instruments
- Understand the use of these spectroscopic methods for organic structure elucidation
- Choose an appropriate spectroscopic technique in their research.

### **EVERYDAY PHYSICS**

**CODE:19PH/PE/ED23**

**CREDITS:3**

**L T P:2 0 1**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To learn the basic concepts of physics
- To understand the principles of various machines through experiments

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain how Physics applies to phenomena in the world around them.
- Understand basic concepts related to Mechanics, Optics, Magnetism, Electricity and Sound

- Acquire a better understanding of these fundamental concepts through experiments
- Appreciate the relation between Electricity and Magnetism
- Understand the basics of light matter interaction

### **ELECTRICAL INSTALLATIONS**

**CODE:19PH/PE/EI23**

**CREDITS:3**

**L T P:2 0 1**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To understand the working principles of the domestic electrical appliances.
- To learn safety measures in the usage of electricity and in handling simple repair works.

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Learn about the significance of electric components
- Understand the significance of various devices and how they operate
- Assess the electricity consumption of household electrical appliances
- Have an hands on experience
- Be aware of the safety practices for handling electrical equipment
- Undertake minor electrical repair works

### **ENERGY PHYSICS**

**CODE:19PH/PE/EP23**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

#### **OBJECTIVES OF THE COURSE**

- To understand various types of energy
- To stress the importance of conservation of energy and the need for alternate source of Energy

#### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the production of electricity from renewable sources of energy
- Acquire knowledge about all proposed renewable energy technologies
- Understand the impact of non-renewable energy sources on our environment
- Describe the need for alternate sources of energy

- Understand the significance of energy conservation and sustainable energy Development