STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Institutional Learning Outcomes

Stella Maris College, an autonomous Catholic institution of higher education, is committed to the highest standards of academic excellence based on sound values and principles, where students are strengthened with whole person education to lead purposeful lives in service to the community and the nation.

The Institutional Learning Outcomes (ILOs) of Stella Maris College (SMC) reflect the broader mission and purpose of the institution. They are the overarching set of learning outcomes that all students, regardless of discipline, must achieve at graduation. All programme and course learning outcomes are mapped to the institutional outcomes, thus reflecting an overall alignment of values, knowledge and skills expected at programme completion. ILOs are designed to help guide individual departments and disciplines in the development of their programme learning outcomes.

The ILOs of SMC are formed by two components:

1. **Core commitments**: Knowledge and scholarship, values and principles, responsible citizenship, service to community
2. **Institutional values**: Quest for truth, spirit of selfless service, empowerment

Upon graduation, students of Stella Maris College will

- Display mastery of knowledge and skills in their core discipline (**Knowledge and Scholarship)**
- Exhibit in all actions and attitudes a commitment to truth and integrity in all contexts, both personal and professional (**Values and Principles)**
- Demonstrate knowledge about their role in society at local and global levels, and actively work for social and environmental justice (**Responsible Citizenship)**
- Engage in the process of self-discovery through a life-long process of learning (**Quest for truth**)
- Demonstrate readiness to serve those who are in need (**Spirit of selfless service**)
- Be able to function effectively and with confidence in personal and professional contexts **Empowerment)**

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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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF PHYSICS

PROGRAMME DESCRIPTION

The goal of the undergraduate programme in Physics is to support and encourage a basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles. It strongly instils in students the ability to ask questions pertaining to the laws of Physics and to obtain solutions by use of qualitative and quantitative reasoning and by experimental investigation. The programme trains students to develop attributes like appreciation of the physical world and the discipline of Physics, curiosity, creativity and reasoned scepticism and understanding links of Physics to other disciplines and to societal issues.

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

C-Credit, **L**-Lecture Hours, **T**-Tutorial Hours, **P**- Practical Hours, **Ex**-Exam Hours,
CA- Continous Assessment Marks, **ES**-End Semester Marks, **M**-Maximum Marks

Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
SEMESTER-I									
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
Allied Core Offered to the Department of Mathematics									
19PH/AC/PM13	Physics for Mathematics I	3	3	0	0	3	50	50	100
19PH/AC/P112	Physics Practical I	2	0	0	3	3	50	50	100
	Life Skills:Personality Development (EL)	3	3	0	0	-	50	-	100
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100
SEMESTER-II									
19PH/MC/TS23	Thermal Physics and Statistical Mechanics	3	3	1	0	3	50	50	100
19PH/MC/ME24	Mechanics	4	4	1	0	3	50	50	100
19PH/MC/P222	Experimental Physics II	2	0	0	3	3	50	50	100
19PH/GC/ES12	Environmental Studies	2	2	0	0	-	50	-	100
Allied Core Offered to the Department of Mathematics									
19PH/AC/PM23	Physics for Mathematics II	3	3	0	0	3	50	50	100
19PH/AC/P222	Physics Practical II	2	0	0	3	3	50	50	100
	Basic Tamil I / General Elective I	2	2	0	0	-	50	-	100
SEMESTER-III									
19PH/MC/EL33	Electronics I	3	3	1	0	3	50	50	100
19PH/MC/OP34	Optics	4	4	1	0	3	50	50	100
19PH/MC/P332	Experimental Physics III	2	0	0	3	3	50	50	100
Allied Core Offered to the Department of Chemistry									
19PH/AC/PC33	Physics for Chemistry I	3	3	0	0	3	50	50	100
19PH/AC/P132	Physics Practical I	2	0	0	3	3	50	50	100
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100
	Basic Tamil II / General Elective II	2	2	0	0	-	50	-	100
SEMESTER-IV									
19PH/MC/MP44	Mathematical Physics	4	4	1	0	3	50	50	100
19PH/MC/P442	Experimental Physics IV	2	0	0	3	3	50	50	100
Allied Core Offered to the Department of Chemistry									
19PH/AC/PC43	Physics for Chemistry II	3	3	0	0	3	50	50	100
19PH/AC/P242	Physics Practical II	2	0	0	3	3	50	50	100
19PH/SS/ PS13	Life Skills:Personal and Social	3	3	0	0	-	50	-	100
	Major Elective I								
SEMESTER-V									
19PH/MC/MM53	Microprocessors and Microcontrollers	3	3	1	0	3	50	50	100
19PH/MC/SS54	Solid State Physics	4	4	1	0	3	50	50	100
19PH/MC/EM54	Electromagnetism	4	4	1	0	3	50	50	100
19PH/MC/P552	Experimental Physics V	2	0	0	3	3	50	50	100
19PH/MC/P652	Experimental Physics VI	2	0	0	3	3	50	50	100

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B.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- Continous Assessment Marks, **ES**-End Semester Marks, **M**-Maximum Marks

Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
Interdisciplinary Core Courses (PH and EC) to students of Physics and Economics									
19ID/IC/RE55	Renewable Energy and Energy Economics	5	5	1	0	3	50	50	100
	General Elective III	2	2	0	0	-	50	-	100
	SAP / SL	2	2	0	0	-	50	-	100
SEMESTER-VI									
19PH/MC/EL63	Electronics II	3	3	1	0	3	50	50	100
19PH/MC/AN64	Atomic and Nuclear Physics	4	4	1	0	3	50	50	100
19PH/MC/QR64	Quantum Mechanics and Relativity	4	4	1	0	3	50	50	100
19PH/MC/P762	Experimental Physics VII	2	0	0	3	3	50	50	100
19PH/MC/P862	Experimental Physics VIII	2	0	0	3	3	50	50	100
19VE/SS/HL63	Life Skills:An Approach to a Holistic Way of Life	3	3	0	0	-	50	-	100
	Major Elective II								
	General Elective IV	2	2	0	0	-	50	-	100
Major Elective Courses									
19PH/ME/EN45	Essentials of Nanoscience	5	4	1	0	3	50	50	100
19PH/ME/LP45	Laser Physics	5	4	1	0	3	50	50	100
19PH/ME/CS45	Communication Systems	5	4	1	0	3	50	50	100
19PH/ME/SP45	Spectroscopy	5	4	1	0	3	50	50	100
19PH/ME/PR45	Project	5	0	0	5	-	50	50	100
General Elective Courses									
19PH/GE/BP22	Basic Principles of Physics	2	1	0	1	-	50	0	100
19PH/GE/HE22	Home Electrical Installations	2	1	0	1	-	50	0	100
19PH/GE/EP22	Energy Physics	2	2	0	0	-	50	0	100
19PH/GE/WL22	Wireless Communication	2	2	0	0	-	50	0	100
Independent Elective Courses									
19PH/UI/GP23	Geophysics	3	0	0	0	3	-	100	100
19PH/UI/AP23	Astrophysics	3	0	0	0	3	-	100	100

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS

(Effective from the academic year 2019–2020)

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

Unit 1 (13 Hours)

Elasticity

1.1 Elasticity - different modulii of elasticity- relation among the elastic modulii - Poisson's ratio - energy stored per unit volume - bending of beams – expression for the bending moment - depression of the loaded end of a cantilever – expression for depression at the midpoint of a beam loaded at the centre (non-uniform bending using pin and microscope) experiment to determine Young's modulus 'E'- expression for elevation at the centre of a beam (uniform bending using scale and telescope) - experiment to determine 'E'.

1.2 Torsion - expression for torque per unit twist-work done in twisting a wire - torsional oscillation of a body - expression for time period of torsional oscillation - experiment to determine rigidity modulus 'G' (Dynamic torsional pendulum).

Unit 2 (13 Hours)

Surface tension

2.1 Surface tension - explanation of surface tension on the basis of Molecular theory - work done in increasing the surface area - angle of contact - excess of pressure inside a curved liquid surface.

2.2 Experimental Determination of surface tension and interfacial surface tension by Drop weight method - variation of surface tension with temperature - Jaegar's method - Quincke's drop - Vapour pressure over flat and curved surfaces.

Unit 3 **(13 Hours)**

Viscosity and low pressure

3.1 Viscosity - coefficient of viscosity - Newton's law - Poiseuilles flow - Determination of coefficient of viscosity of a liquid (variable pressure head method) - Stoke's law - Rotation Viscometer - Ostwald viscometer - variation of viscosity with temperature-Air pump - McLeod gauge.

3.2 Stream line flow-turbulent flow - critical velocity - Reynold's number - Euler's equation.

Unit 4 **(13 Hours)**

Sound – I

4.1 Wave motion - Characteristics - longitudinal and transverse waves - equation of simple harmonic wave - Superposition of two simple harmonic waves in vertical direction - differential equations of wave motion - velocity and frequency of transverse waves along stretched strings - Lissajou's figures – uses.

4.2 Law of vibrating strings – Harmonics – Melde's experiment – Stringed instruments – Harp – Violin – Piano – Standing waves – Beats – Doppler effect.

Unit 5 **(13 Hours)**

Sound - II

5.1 Acoustics - Reverberation time and its measurement - Sabine's formula - Absorption coefficient and its determination - Condition for good acoustical design of an auditorium.

5.2 Ultrasonic – Piezo-electric effect - Piezo-electric generator - Detection and applications of Ultrasonics

BOOKS FOR STUDY

Mathur, D.S., Elements of Properties of Matter**,** Shyamlal Charitable Trust, New Delhi. (2010).

Murugesan.R, Properties of Matter and Acoustics**,** S.Chand and Company Ltd., New Delhi, (2013).

Brijlal and Subrahmanyam – A text book of Sound, Vikas publishing house (2018)

BOOKS FOR REFERENCE

Halliday, David. Robert Resnick and Jearl Walker, Fundamentals of Physics, John Wiley and Sons, Inc., Replica Press Pvt. Ltd., Kundhi, (2001).

Young Hugh D. Freedman Roger A, University Physics, Addison Wesley Longman,Inc., Pinnacle Book Pvt Ltd., New Delhi, (2016).

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & -2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS: BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020**)**

EXPERIMENTAL PHYSICS I

CODE:19PH/MC/P112 **CREDITS :2**
L T P :0 0 3
TOTAL HOURS :39

1. Young's Modulus - Non – uniform bending (Pin and Microscope)
2. Potentiometer – Calibration of Voltmeter (Low Range)
3. Young's Modulus - Uniform Bending (Scale and Telescope)
4. Surface Tension and Interfacial Surface Tension - Drop Weight Method.
5. Rigidity Modulus 'G' using Torsion Pendulum with Weights.
6. Lee's Disc – Thermal Conductivity of a Bad Conductor.
7. Spectrometer – Determination of the Refractive Index of the Material of Solid and Liquid Prism.
8. B.G. Figure of Merit - Current Sensitivity.
9. Zener Diode Characteristics

BOOKS OF STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007

Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT:

Continuous Assessment Test		**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20		
Observation & Calculation	20		
Result & Accuracy	10		

End-Semester Examinations		**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20		
Observation & Calculation	20		
Result & Accuracy	10		

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

SYLLABUS
(Effective from the academic year 2019 – 2020)

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

Unit 1 **(13 Hours)**

Food and Health

1.1 Traditional food and their health benefits

1.1.1 **Six tastes –** Natural guide map towards proper nutrition

1.1.2 Nutritional value and significance of Navadhanya (Sesame seed, Bengal gram, Horse gram, Green gram, Paddy seeds, White beans, Wheat, black gram and Chick pea) and Greens (Vallarai, Thuthuvalai, Manathakkali, Pulichakeerai, Agathi Keerai, Murungai Keerai, Karuveppilai, Puthina and Kothamalli)

1.2 Causes, symptoms and home remedies for the following ailments

Common cold, Anaemia, Hypothyroidism, Obesity, Diabetes, Mellitus, Polycystic Ovarian Syndrome, Ulcer, Wheezing and Hypertension

Unit 2 **(13 Hours)**

Food and energy balance

2.1 Units of Energy, Components of Total Energy Requirement – Basal Metabolic Rate, energy requirements for (work) physical activity and Thermic effect of food

2.2 Factors affecting Basal Metabolic Rate and Thermic Effect of food

2.3 Recommended Dietary Allowances and Balanced Diet, Food Energy Values-Calculation

Unit 3 **(13 Hours)**

3.1 Energy conservation

3.1.1 Needs for Energy Conservation – Power consumption of domestic appliances – Electrical Energy Audit – Strategies for Energy Conservation - Modern lighting systems– Light emitting diode (LED), Compact fluorescent lamps (CFL), Green indicators and Inverter, Green building - Home lighting using Solar cell - Solar water heaters- Water and waste management - Biogas plant

3.1.2 Safety Practices in using electronic gadgets and electricity at home – Precautions - Shock- Use of testers to identify leakage

3.2 Computer fundamentals

3.2.1 Essentials of Purchasing a Personal Computer - Fundamentals of Networks – Local Area Network, Internet, Networking in real-time scenario- Computer Hacking – Computer Forensics Fundamentals – Cyber Laws - Secure Browsing

3.2.2 **Configuring Email**

Configure Email Settings – Attachments – Compression – Organizing Emails – Manage Folders - Auto Reply - Electronic Business Card - Email Filters- Manage Junk Mail - Calendar - Plan Meetings, Appointments - Scheduling Emails

3.2.3 Emerging Trends in IT - 3D Printing, Cloud Storage, Augmented Reality, Artificial Intelligence, Internet of Things (IoT)

BOOKS FOR REFERENCE

Achaya K. T. *The Illustrated Foods of India*. Oxford Publications, 2009.

Guyton, A.C. *Text Book of Medical Physiology*. (12th ed.). Philadelphia: W.B. Saunders & Co., 2011.

Joe Benton, *Computer Hacking: A Beginner's Guide to Computer Hacking, How to Hack, Internet Skills, Hacking Techniques, and More!,* Createspace Independent Pub, 2015.

John Vacca, *Computer Forensics*: Computer Crime Scene Investigation, Laxmi Publications 2015.

Pradeep Sinha, Priti Sinha, *Computer Fundamentals 6th Edition*, BPB Publications, 2003.

Srilakshmi, B. *Nutrition Science* (4th Revised Edition), New Delhi: New Age International (P) Ltd., 2014.

Suzanne Le Quesne *Nutrition: A Practical Approach*, Cornwall: Thomson, 2003.

Therapeutic Indes – Siddha, 1st edition, SKM Siddha and Ayurveda, 2010.

Trevor Linsley, *Basic electrical installation work.* Newnes rint of Elsevier 2011.

PATTERN OF ASSESSMENT

Continuous Assessment: **Total Marks: 50**

Two to three Task based components
Task based classroom activities
Case studies
Group discussions
Group presentation
Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to Students of Mathematics

SYLLABUS

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

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.

Unit 1 **(6 Hours)**

Mechanics - I

1.1 Impulse-Impact-Conservation of linear momentum: Internal forces and momentum conservation – center of mass- examples- General elastic collision of particles of different masses.

1.2 Significance of conservation laws- law of conservation of Energy- concepts of work- power – energy – potential energy.

Unit 2 **(7 Hours)**

Mechanics - II

2.1 Simple Harmonic Motion: Periodic and Harmonic Motion- Formula for acceleration, velocity and displacement - Energy of a Harmonic Oscillator- oscillation in spring mass-springs in series and parallel.

2.2 Classical mechanics: Degrees of freedom and constraints - Generalized Coordinates - principle of virtual work - De Alembert's principle -Explanation of Lagrangian equation (No derivation) Application of Lagrangian equation in Atwood's machine and Simple pendulum.

Unit 3 **(6 Hours)**

Elasticity

3.1 Elastic properties : Hooke's law - Elastic limit - moduli of Elasticity - Poisson's ratio

3.2. Expression for Bending Moment - Depression at the loaded end of the cantilever – depression and elevation at the mid point of a loaded beam (non-uniform and uniform bending) – Torsion in a wire – Torque per unit twist – torsional oscillations – Expression for period

Unit 4 **(7 Hours)**

Surface Tension and Viscosity

4.1 Stream Line Flow and Turbulent Flow – Critical Velocity – Euler's Equation for unidirectional flow - Newton's formula.

4.2 Surface Tension: Definition – molecular theory of surface tension - Determination of Surface Tension by Drop Weight Method- Interfacial Surface Tension

Unit 5 **(13 Hours)**

Relativity

5.1 Newton's Laws of Motion and its Limitations- Inertial Frames of Reference – Newtonian Relativity – Galilean Transformation Equations

5.2 Postulates of Special Theory of Relativity- Lorentz Transformation Equations- Length Contraction - Time Dilation - Twin Paradox and Meson Paradox

5.3 Relativistic Momentum (no derivation) – Mass Energy Relation- Physical Significance.

BOOKS FOR STUDY

Murugeshan R. *Properties of Matter and Acoustics.* New Delhi: S Chand, 2013.
Narayanamurthi M. & N Nagarathnam. *Dynamics.* Chennai: The National, 1996.
Resnick, Robert. *Introduction to Special Relativity*. New Delhi: Wiley Eastern, 2007.

BOOKS FOR REFERENCE

Goldstein Herbert. Second Edition. *Classical Mechanics.* U.S.A: Addison & Wesely, 1980.
Halliday, David and Robert, Resnick. *Physics Vol.I.* Chennai: New Age, 1995.
Halliday, David Robert Resnick and Walker Jearl. *Fundamentals of Physics*. Kundhi: John Wiley, 2001.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
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Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to the Students of Mathematics

SYLLABUS
(Effective from the academic year 2019–2020**)**

PHYSICS PRACTICAL I

CODE:19PH/AC/P112 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Compound Pendulum – Determination of 'g'.
2. Young's Modulus 'E' by Non-Uniform Bending- Pin and Microscope
3. Young's Modulus 'E' by Uniform Bending-Scale and Telescope
4. Rigidity Modulus 'G' by Torsional pendulum (Moment Of Inertia to be assumed)
5. Surface Tension and Interfacial Surface Tension – Drop Weight Method.
6. Spectrometer – Determination of the Refractive Index of the material of a prism
7. Post Office Box – Verification of Laws and Determination of Specific Resistance
8. Characteristics of a Zener Diode
9. Newton's Law of Cooling using two liquids – Verification of Law.

BOOKS FOR STUDY

Ouseph, C.C., Srinivasan, V., &Balakrishnan,R. *A Text Book of Practical Physics.Vol. I &II.*,Chennai: S. Viswanathan, 2007.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 3 hours**

Formula & Procedure	20
Observation & Calculation	20
Result & Accuracy	10

End-Semester Examination: **Total Marks: 50** **Duration: 3 hours**

Formula & Procedure	20
Observation & Calculation	20
Result & Accuracy	10

STELLA MARIS COLLEGE (AUTONOMOUS), CHENAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS

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

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

Unit 1 **(10 Hours)**

Transport Phenomena and Radiation

1.1. Blackbody radiation - distribution of energy in the spectrum of a black body - experimental arrangement to study energy distribution in black body spectrum experimental results-statements of Stefan - Boltzmann and Wiens' displacement law -Quantum theory of radiation

1.2. Average energy of Planck's oscillator - Planck's hypothesis - Planck's radiation relation - Stefan-Boltzmann law from Planck's radiation relation – Wien's and Rayleigh - Jeans law from Planck's' radiation relation

Unit 2 **(11 Hours**)

Thermodynamics

2.1 Thermodynamic systems-thermal equilibrium and concept of temperature - zeroth law of thermodynamics – thermodynamic processes- internal energy - first law of thermodynamics (statement) - isothermal and adiabatic elasticity of a gas

2.2 Second law of thermodynamics – statements of Clausius and Kelvin - principle of a heat engine - thermodynamics of refrigeration-coefficient of performance - thermodynamic potentials (definition)

Unit 3 **(10 Hours)**

Entropy

3.1 Entropy- definition-entropy change in reversible and irreversible processes - entropy and unavailable energy - entropy of a perfect gas-temperature – entropy diagram - technical importance of T-S Diagram - law of increase of entropy - entropy and disorder

3.2 Second law of thermodynamics in terms of entropy- expression connecting first and second laws of thermodynamics - statement of third law of thermodynamics

Unit 4 **(10 Hours)**

Maxwell's Thermodynamical Relations

4.1 Maxwell's thermo dynamical relations - deduction from thermodynamical relations - first and second Tds equations - variation of intrinsic energy with volume – [$C_p - C_v = R$] equation - Clausius – Clapeyron latent heat equation

Unit 5 **(11 Hours)**

Low Temperature Physics and Statistical Physics

5.1 liquefaction of gases-liquefaction of helium- peculiar properties of liquid helium ii-production of very low temperature - adiabatic demagnetization of paramagnetic salt - theory and experiment

5.2 definition of phase space-micro and macro states- concepts of ensembles - definition of thermodynamic probability-relation between entropy and probability - classical statistics - Maxwell-Boltzmann statistics

BOOKS FOR STUDY

R. Murugesan. Er. Kiruthiga Sivaprasath. *Thermal Physics*. New Delhi: S Chand: Popular, 2014.

Subrahmanyan. N and Lal Brij. *Heat Thermodynamics and Statistical Physics.* New Delhi: S. Chand, 2018.

Mathur.D.S. *Heat and Thermodynamics.* New Delhi: Sultan Chand, 2008.

BOOKS FOR REFERENCE

Rajam,J.B. *Heat and Thermodynamics.* New Delhi: S Chand, 1981

Kakani,S.L. *Heat, Thermodynamics and Statistical Mechanics.* New Delhi: Sultan Chand, 1989.

Bhatia,V.S. *Thermodynamics and Kinetic Theory***,** New Delhi: Shobanlal Nagin Chand 1993.

Das Gupta ,A.K. *Fundamentals of Statistical Mechanics.* Calcutta: New central 1994.

Gupta and Kumar. *Elementary Statistical Mechanics*. Meerut: Pragati Prakasham, 1993.

JOURNALS

Thermodynamics and Statistical Mechanics - Springer

Classical Continuum Physics – Springer

WEB RESOURCES

http://www.sites.fas.harvard.edu/6346 : Statistical Mechanics and Thermodynamics

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS

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

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

Unit 1 **(13 Hours)**

Laws of motion

1.1 Newton's Laws- forces – equations of motion - frictional force - motion of a particle in a uniform gravitational field – Newton's law of universal gravitation - examples.

1.2 Everyday forces of Physics: gravity - electrostatic force- tension - friction. Electric and magnetic forces on a charged particle - magnetic field and Lorentz force- motion of charged particle in uniform constant electric field.

Unit 2 **(13 Hours)**

Conservation laws of linear and angular momentum

2.1 Conservation of linear and angular momentum - Internal forces and momentum conservation – center of mass- examples

2.2 General elastic collision of particles of different masses – system with variable mass – examples

2.3 Conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass- proton scattering by heavy nucleus.

Unit 3 **(13 Hours)**

Conservation laws of energy

3.1 Introduction - significance of conservation laws- law of conservation of Energy- concepts of work- power – energy.

3.2 Conservative forces – potential energy and conservation of energy in gravitational and electric field- examples

3.3 Non- conservative forces – General law of conservation of energy

Unit 4 **(14 Hours)**

Rigid Body Dynamics

4.1 Translational and Rotational motion- angular momentum- moment of inertia- General theorems of moment of inertia - examples

4.2 Rotation about fixed axis - Kinetic energy of rotation – examples - body rolling along a plane surface – body rolling down an inclined plane

4.3 Gyroscopic Precision - Gyrostatic applications

Unit 5 **(12 Hours)**

Lagrangian Mechanics

5.1 Generalized coordinates - Degrees of Freedom – Constraints

5.2 Principle of Virtual Work and D' Alembert's Principle

5.3 Lagrange's Equation From D' Alembert's Principle – Application- Simple Pendulum – Atwood's Machine

BOOKS FOR STUDY

Mathur D.S. *Mechanics.* New Delhi: S. Chand, 2000.

Narayanamurthi, M. and Nagarathnam, N. *Dynamics*. Chennai: The National Publishing, 1998.

Narayanamurthi, M. and Nagarathnam. N. *Statics, Hydrostatics and Hydrodynamics.* Chennai: National, 1982.

BOOKS FOR REFERENCE

Goldstein Herbert. *Classical Mechanics.* U.S.A: Addison and Wesely, 1980.

Halliday, David and Robert, Resnick. *Physics Vol.I.* Chennai: New Age, 1995.

Halliday, David Robert Resnick and Walker Jearl. *Fundamentals of Physics*. New Delhi: John Wiley, 2001.

JOURNALS

Science Direct – Publishers

European Journal of Mechanics

WEB RESOURCES

https://www.coursera.org/course/particles2planets

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020**)**

EXPERIMENTAL PHYSICS II

CODE:19PH/MC/P222 **CREDITS :2**
L T P :0 0 3
TOTAL HOURS :39

1. Compound Pendulum – Determination of 'g', 'k' and 'I'.
2. Sonometer – Verification of Laws and Determination of frequency of tuning fork – and unknown mass.
3. Rigidity Modulus determination of 'G' by Static Torsion
4. Specific Heat of Solid – Method of Mixtures – Barton's Correction
5. Surface Tension – Capillary Rise method
6. Potentiometer –Ammeter Calibration (High Range and Low range)
7. B. G – Determination of Absolute Capacity of a Condenser
8 Spectrometer – Grating – Normal Incidence (i) Standardization of the Grating (N) (ii) Determination of the Wavelength of the prominent lines of the Mercury Spectrum. (iii) Dispersive Power of the Grating
9. UJT Chracteristics

BOOKS OF STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan. *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.
Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

General Core Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

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

Unit 1 **(10 Hours)**

1.1 Introduction: The multidisciplinary nature of environmental studies; Environmental Ethics-Role of the Individual in protecting the environment

1.2 Natural Resources: renewable (forests and water)and non-renewable (minerals)-energy resources: renewable and non-renewable sources, impact of over-exploitation

1.3 Ecosystems: terrestrial (forest, grassland and desert) and aquatic (ponds, oceans and estuaries); structure and function

1.4 Biodiversity: India as a mega-diversity nation; threats to biodiversity; i*n-situ* and *ex-situ* conservation of biodiversity

1.5 Solid Waste Management, Source Segregation and Rain Water Harvesting

Unit 2 **(10 Hours)**

2.1 Environmental Pollution: Air, Water, Noise and Plastic Pollution: causes, effects and control measures -Impact of over-population on pollution and health – carbon footprint

2.2 The Environmental Dimension of Sustainable Development: The United Nations Sustainable Development Goals of the 2030 Agenda

2.3 Climate Change and Environmental Disasters: Natural Disasters: floods, earthquakes, cyclones, tsunamis and landslides; man-made disasters: Bhopal Gas Tragedy and Chernobyl Nuclear Disaster

2.4 Environmental Movements: Chipko, Silent Valley and Narmada Bachao Andolan International Agreements: Montreal Protocol, Kyoto Protocol and Climate Change Conferences

2.5 An Overview of Environmental Laws in India: Environmental (Protection) Act 1986, Biological Act, 2002, National Green Tribunal Act, 2010, Coastal Regulation Zone Notification, 2011

Unit 3 **(6 Hours)**

3.1 A study of the eco-friendly initiatives on campus

3.2 A critical review of an environmental documentary film

3.3 Ecofeminism and the contributions of Indian Women Environmentalists

3.4 The highlights of Environmental Encyclical-*Laudato si*-On Care for our Common Home

3.5 Environmental Calendar

BOOK FOR STUDY

Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses,* (2nd ed.) Universities Press, 2013.

BOOKS FOR REFERENCE

Bhattacharya, K.S. Arunima Sharma, *Comprehensive Environmental Studies* Narosa Publishing House Pvt.. Ltd., New Delhi, 2015.

Saha, T.K., *Ecology and Environmental Biology* Books and Allied (P) Ltd., Kolkata 2016.

Sharma, J.P. *Environmental Studies (for undergraduate classes)* 3rd edition, University Science Press, 2016.

JOURNALS

Journal of Environmental Studies and Sciences

Journal of Environmental Studies

WEB RESOURCES

www.enn.com

www.nationalgeographic.com

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 25** **Duration: 60 minutes**

Section A-10 x 1 = 10 Marks (All questions to be answered) Multiple Choice Questions

Section B - 3 x 5 = 15 Marks (3 out of 6 to be answered in 150 words each)

Other Component: **Total Marks: 25**

Any **one** of the following for 25 marks

Quiz/Scrap Book/Assignment / Poster Making/Case Study/Project/Survey/Model-Making

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to Students of Mathematics

SYLLABUS

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

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

Unit 1 **(6 Hours)**

Electricity

1.1 Quantisation of Charge – Conservation of Electric Charge – Coulomb's Law of Force between Charges – Flux of Electric Field – Gauss's Law – Statement and Proof – Electric Field of a Point Charge Using Gauss Law – Electric Potential – Relation between Potential and Field Strength

1.2 Capacitance- Capacitance of Parallel Plate Capacitor with and without Dielectric

Unit 2 **(7 Hours)**

Magnetism

2.1 Magnetic Field: Definition of B – Force on a Charge in a Magnetic Field, in an Electromagnetic Field (Lorentz Force) – Maxwell's Electromagnetic Equations (No Derivation) – Physical Significance of the Equations

2.2 Electromagnetism: Force on a Current Carrying Conductor in a Magnetic field – Moving Coil Ballistic Galvanometer – Theory, Current and Charge Sensitivity of B.G – Relation between the two

Unit 3 **(6 Hours)**

Geometrical Optics

3.1 Defects of Images- Monochromatic Aberrations and its types-Chromatic Aberration – Achromatic Combination of Lenses in Contact and Lenses Separated by a Distance

3.2 Optical Instruments: Telescopes – Angular Magnification of Telescopes –

Refractive Astronomical Telescope – Terrestrial Telescope – Reflecting Telescopes – Radio Telescope – Hubble Telescope

Unit 4 **(7 Hours)**

Physical Optics

4.1 Interference: Newton's Rings – Measurement of Wavelength - Diffraction: Introduction – Fraunhofer Diffraction – Transmission Grating – Normal Incidence – Determination of Wavelength

4.2 Polarisation – Double Refraction – Nicol Prism – Optical Activity– Uses of Polaroids.

Unit 5 **(13 Hours)**

Electronics

5.1 Introduction to Amplifiers - Operational Amplifier – Ideal Op- Amp - CMRR – Inverting and Non- Inverting Op- Amp - Summing, Difference, Integral and Differential Op- Amp

5.2 Boolean Algebra- De Morgan's Theorem – Verification - Algebraic Simplification – Implementation of Boolean Algebra into Circuits-Karnaugh map upto four variables.

BOOKS FOR STUDY

Subramaniam N. and Brijlal. *Optics.* New Delhi: S Chand, 2014.

Kakani, S L, and Bhandari K C. *A Text Book of Optics*. New Delhi: Sultan 2002.

Mahajan, A.S.,and Rangwala, A.A. *Electricity and Magnetism.* New Delhi: Tata McGraw Hill, 2017.

Mehta, V.K. *Principles of Electronics*. New Delhi: S Chand, 2014 .

BOOKS FOR REFERENCE

Subrahmanyam, N. and Lal Brij. *A Text Book of Electricity and Magneti*sm. Agra: Ratan Prakash, 1994.

Haliday, David and Robert Resnick. *Physics Vol. II*. Chennai: New Age, 1995.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLAMARISCOLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to the Students of Mathematics

SYLLABUS
(Effective from the academic year 2019 – 2020)

PHYSICS PRACTICAL II

CODE:19PH/AC/P222 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Rigidity Modulus 'G' by Static Torsion
2. Newton's Rings – Determination of Radius of Curvature of a Lens
3. Spectrometer – Grating – Normal Incidence - Determination of Wavelengths (λ)
4. Joule's Calorimeter – Determination of Specific Heat of a Liquid – Half Time Correction
5. Potentiometer – Ammeter Calibration (Low Range)
6. OPAMP- Inverting and Non Inverting Amplifier
7. Specific Capacity of a Solid – Method of Mixtures
8. Carey Foster's bridge –Determination of Specific Resistance
9. Coefficient of Viscosity – Absolute Determination.

BOOKS FOR STUDY

Ouseph,C. C., V.Srinivasan and R. Balakrishnan.*A Text Book of Practical Physics. Vol. I & II.*Chennai: S.Viswanathan, 2007.

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

PSTELLA MARIS COLLEGE (AUTONOMOUS), CHENAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS

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

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

Unit 1 **(10 Hours)**

Number Systems and Binary Concept

1.1 Introduction – Analog and Digital Signals – Digital Circuit - Decimal- Binary - Octal and Hexa Number Systems

1.2 Binary Arithmetic – Principles of Addition –Subtraction- 1s Complement and 2s Complement Method - Multiplication and Division

Unit 2 **(12 Hours)**

Boolean Algebra, Digital Arithmetic Circuits and K-map

2.1 Morgan's Theorem - Implementation of Boolean Algebra into Circuits Half Adder – Full Adder – Half Subtractor – Full Subtractor - Parallel Binary Adder

2.2 Fundamental Products – SOP and POS Forms - Karnaugh Map - Simplification up to four Variables (SOP Only)-Don't Care Conditions - Realization of Logic Circuits

Unit 3 **(12 Hours)**

Flip - Flops, Registers and Counters

3.1 Flip-Flops : RS - Clocked RS – D-T - JK and Master Slave Flip-Flops and Their Truth Tables

3.2 Registers and Counters: Shift Registers – Right Shift - Left Shift Registers - Binary Ripple Counter (4 bit up counter-4 bit down counter) - Decade Counter.

Unit 4 (8 Hours)

Integrated Circuits – Fabrication and Characteristics

4.1 Integrated Circuit Technology: Scale of Integration –SSI, MSI, LSI, BLSI. Basic Monolithic Integrated Circuits – Fabrication Process-Epitaxial Growth – Masking and Etching - Diffusion of Impurities

4.2 Transistors for Monolithic Circuits – Monolithic Diodes – Integrated Resistors - and Capacitors

Unit 5 (10 Hours)

Special Purpose Diodes

5.1 Introduction - Light Emitting Diode (LED) – LED Voltage and Current- Advantages.

5.2. Multicolor Leds - Applications –Power Indicator –Seven Segment Display- Photo Diode – Operation- Characteristics and Applications

BOOKS FOR STUDY

Malvino Albert Paul. *Electronic Principles***.** New Delhi: Tata McGraw Hill, 1998.
Malvino Albert Paul and Leach Donald. *Digital Principles and Application*. New Delhi: Tata McGraw Hill, 2006.
Mehta V.K. *Electronic Principles*. New Delhi: S Chand, 2014.

BOOKS FOR REFERENCE

Allen Mottershead. *Electronic Devices and Circuits.* New Delhi: Prentice Hall of India, 1982.
Ambrose A and T. Vincent Devaraj. *Elements of Solid State Electronics***.** New Delhi: Meera, 1990.
Floyd Thomas L. *Digital Fundamentals.* New Delhi : Universal Book Stall, 1997.
Milmann and Halkias. *Integrated Electronics*. New Delhi: Tata McGraw Hill, 1992.
Sedha R.S. *Applied Electronics.* New Delhi: S Chand, 1997.

PATTERN OF ASSESSMENT

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: Total Marks: 50

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

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

B.Sc. DEGREE: BRANCH III –PHYSICS

SYLLABUS

(Effective from the academic year 2019-2020)

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 minims aberrations
- Solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations

Unit 1 **(13 Hours)**

Geometrical optics

1.1 Fermat's principle of least time – importance of Fermat's principle in relation to the main postulates of geometrical optics – rectilinear propagation of light reversibility of the path of the rays of light – the laws of reflection and refraction of light. Huygen's principle of wavefront propagation and its limitations.

1.2 Thick lenses – focal length , critical thickness ,power and cardinal points of a thick lens.

Unit 2 **(13 Hours)**

Lens aberrations and Eyepiece

2.1 Lens aberrations: monochromatic aberrations – spherical aberration- coma- astigmatism - curvature of the field – distortion – chromatic aberrations- methods of minimizing aberrations.

2.2 Eyepieces: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces – construction and working – relative merits and demerits of the eyepiece.

Unit 3 **(13 Hours)**

Interference

3.1 Division of wave front : Fresnel's biprism –theory- fringes with white light - Division of amplitude : Interference in thin films due to (i) reflected light (ii) transmitted light – colours of thin films- Newton's rings – theory.

3.2 Interferometers : Michelson's Interferometer- applications (i) determination of the wavelength of a monochromatic source of light (ii) standardization of the meter.

Unit 4 **(13 Hours)**

Diffraction

4.1 Fresnel's assumptions –Zone plate- action of zone plate for an incident spherical wave front- differences between a zone plate and a convex lens. Fresnel type of diffraction :- diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit. Fraunhofer type of diffraction : Fraunhofer diffraction at a single slit- plane diffraction grating – theory- experiment to determine wavelengths – width of principal maxima.

4.2 Resolving power of optical instruments : Rayleigh's criterion for resolution – limit of resolution for the eye- resolving power of (i) telescope (ii) grating.

Unit 5 **(13 Hours)**

Polarisation

5.1 Double Refraction- optic axis principal plane – Huyghen's explanation of double refraction in uniaxial crystals.

5.2 Elliptically and circularly polarized light –quarter wave plate- half wave plate- production and detection of circularly polarized light and elliptically polarized light. Optical activity- Fresnel's explanation – specific rotation – Laurent half shade polarimeter- experiment to determine specific rotatory power.

BOOKS FOR STUDY

Jenkins A.Francis and White, Fundamentals of Optics, 4th edition, McGraw Hill Inc., New Delhi, 2011

Subramaniam N. and Brijlal, Optics, S.Chand and Co, Pvt. Ltd. 25th edition reprint,New Delhi, 2014

BOOK FOR REFERENCE

Agarwal B. S. Optics, Kedernath Ramnath Publishers**,** Meerut, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020**)**

EXPERIMENTAL PHYSICS III

CODE:19PH/MC/P332 **CREDITS :2**
L T P :0 0 3
TOTAL HOURS :39

1. Melde's Apparatus – Determination of the Frequency of the Tuning Fork using – Transverse and Longitudinal Mode of Vibrations of the String.
2. Ballistic Galvanometer – Comparison of Capacitance
3. Potentiometer – Determination of Resistance and Specific Resistance
4. Multimeter- Conversion of Low Range Ammeter to High Range Ammeter.
5. Spectrometer - Dispersive Power of the Prism and Cauchy's Constants
6. Newton's Rings – Determination of radius of curvature of lens.
7. Bifilar Pendulum – Verification of perpendicular axes theorem.
8. Absolute Determination and Comparison of Coefficient of Viscosities of Liquids
9. OPAMP – Adder, Subtractor, Multiplier, Integrator and Differntiator.

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.

Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86

Allied Core Offered by the Department of Physics to Students of Chemistry

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

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

Unit 1 **(6 Hours)**

Properties of Matter

1.1 Elasticity: Moduli of Elasticity – Poisson's Ratio- Young's Modulus – Bending of Beams - Expression for Bending Moment-Depression at the Loaded End of the Cantilever-Depression and Elevation at the Mid Point of a Loaded Beam- Torsion in a Wire–Torsional Oscillations–Torque Per Unit Twist-Expression for Period

Unit 2 **(7 Hours)**

Surface Tension and Viscosity

2.1 Introduction-Experimental Determination of Surface Tension and Interfacial Surface Tension by Drop Weight Method –Variation of Surface Tension with Temperature-Streamline and Turbulent Flow –Critical Velocity- Expression for Critical Velocity- Variation of Viscosity with Temperature

Unit 3 **(6 Hours)**

Mechanics

3.1 Dynamics: Moment of Inertia – Definition - Compound Pendulum - Expression for the Period of Oscillation-Centre of Suspension and Centre of Oscillation–Minimum Period of Oscillation of a Compound Pendulum-Determination of 'G'

Unit 4 **(13 Hours)**

Relativity

4.1 Inertial Frames of Reference-Special Theory of Relativity—Postulates of Special Theory of Relativity-Lorentz Transformation Equations-Length Contraction-Time Dilation – Experimental Evidence – Twin Paradox – Relativistic Momentum (no derivation) – Mass Energy Relation – Physical Significance

Unit 5 **(7 Hours)**

Optics

5.1 Interference: Introduction - Interference Due to Reflected Light – Newton's Rings – Measurements of Wavelength
Diffraction: Introduction-Fraunhoffer Diffraction- Transmission Grating-Normal Incidence – Determination of Wavelength

5.2 Polarisation: Introduction-Plane of Polarization-Polarisation by Refraction-Brewster's Law-Polarisation by Reflection-Double Refraction – Nicol Prism – Nicol Prism as a Polarizer and Analyser – Polaroids-uses of Polaroids

BOOKS FOR STUDY

Murugeshan.R, *Properties of Matter*. New Delhi: S. Chand, 2012.
Naranyanamurthi.M and Nagaratham.N. *Dynamics.* Chennai: The National, 1994.
Naranyanamurthi.M and Nagaratham.N. *Statics.* Chennai: The National, 1994.
Murugeshan.R, *Modern Physics*. New Delhi: S Chand, 2013.
Subrahmanyan. Nand Lal Brij. *Textbook of Optics.* New Delhi: Vikas, 2013.

BOOK FOR REFERENCE

Halliday,David and Robert Resnick. *Physics Vol I and II*. Chennai: New Age, 1995.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLAMARISCOLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to the Students of Chemistry

SYLLABUS
(Effective from the academic year 2019–2020**)**

PHYSICS PRACTICAL I

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

1. Compound Pendulum – Determination of 'g'.
2. Young's Modulus 'E' by Non-Uniform Bending- Pin and Microscope
3. Young's Modulus 'E' by Uniform Bending-Scale and Telescope
4. Rigidity Modulus 'G' by Torsional Oscillations (Moment of Inertia to be assumed)
5. Surface Tension and Interfacial Surface Tension – Drop Weight Method
6. Spectrometer – Determination of the Refractive Index of the Material of a Prism
7. Post Office Box – Verification of Laws and Determination of Specific Resistance
8. Characteristics of a Zener Diode
9. Newton's Law of Cooling using two liquids – Verification of Law

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol.I & II.* Chennai: S.Viswanathan, 2007.

PATTERN OF ASSESSMENT

Continuous Assessment Test :	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS
(Effective from the year 2019-2020)

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

Unit 1 (13 Hours)

Vector Calculus

1.1 Scalar Point Function - Gravitational Potential and Electrostatic Potential - Vector Point Function – Electric Intensity and Magnetic Field - Directional Derivatives - Gradient of a Scalar Field – Work done – Moment of a force

1.2 Vector Differentiation – Determination of Velocity and Acceleration From Position Vector - Partial Differentiation of Vectors

Unit 2 (13 Hours)

Vector Analysis

2.1 The Divergence of a Vector Function - the Curl or Rotation of a Vector Function - Geometrical Interpretation - Physical Significance – Directional derivative

2.2 Gauss' law in differential form-Relations between Gradient, Divergence and Curl – Electrostatic Potential and Field – Maxwell's Equations.

Unit 3 (13 Hours)

Vector Integration

3.1 Vector Integration: Ordinary Integrals of Vectors - Line Integrals - Surface Integrals - Volume Integrals

3.2 Gauss's Divergence Theorem - Statement and Physical Interpretation - Stoke's Theorem and Green's Theorem (Statement Only) - Poisson's Equation and Laplace's Equations - Their Applications in Gravitation, Hydrodynamics and Electromagnetism.

Unit 4 **(13 Hours)**

Differential Equations

4.1 Initial and Boundary Value Problems - Applications of First Order Differential Equations - Falling Body Problems - Electrical Circuits (RL and RC) – Growth and decay problems

4.2 Second Order Differential Equations with Constant Coefficients: The Characteristic Equation – General Solutions - Applications of Second Order Differential Equations - (i) System of Springs (ii) Electrical Circuits (LCR).

Unit 5 **(13 Hours)**

Complex Analysis

5.1 Complex numbers – fundamental laws of algebra on complex numbers – Argand diagram – properties of moduli – Arguments – Geometry of complex numbers – General equations of line and circle.

5.2 Functions of a complex variable – continuity and differentiability – Analytic function – Cauchy Riemann equation – Laplace equation – Harmonic function

BOOKS FOR STUDY

Bronson Richard. *Schaum's Outline of Theory and Problems of Differential Equations.* New Delhi: Tata McGraw Hill, 2014.

Gupta B.D. *Mathematical Physics.* New Delhi: Vikas, 2014.

Murray R.Spiegel. *Schaum's Outline of Theory and Problems of Vector Analysis.* New Delhi: Tata McGraw Hill, 2014.

Satyaprakash. *Mathematical Physics.* New Delhi: Sultan Chand, 2004.

BOOKS FOR REFERENCE

Dass M.K. *Mathematical Physics.* New Delhi: S.Chand, 2001.

Prakash Satya. *Mathematical Physics with Classical Mechanics.* New Delhi: Sultan Chand, 2004.

JOURNALS

Journal of Mathematical Physics

Communications in Mathematical Physics

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020**)**

EXPERIMENTAL PHYSICS IV

CODE:19PH/MC/P442 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Newton's Law of Cooling – (i) Verification (ii) Determination of Specific Heat Capacity of a Liquid (iii) Determination of Emissivity of the Surface
2. Joule's Calorimeter – Determination of Specific Heat Capacity of a Liquid – Barton's Correction.- using P.O Box to find Resistance of the Coil
3. Determination of Self Inductance using LCR Resonance Circuit
4. Potentiometer – EMF of a thermocouple
5. B.G. – High Resistance by Leakage
6. Field along the axis of the Coil – Determination of H and B
7. Latent Heat of Fusion of Ice - Barton's Correction
8. PV Characteristics of Solar Cell
9. RC Coupled Amplifier

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.
Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examinations:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

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

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.

Unit 1 **(6 Hours)**

Electricity

1.1 Coulomb's Law of Inverse Squares - Flux of Electric Field - Gauss's Law – Application of Gauss's Law to Determine Field a Point Charge, Spherical Charge Distribution, Infinite Line Charge Distribution and Cylindrical Charge Distribution

1.2 Conservative Nature of Electrostatic Field – Electric Field – Electric Potential – Potential at a Point Due to Point Charge- Relation between Potential and Field Strength, Capacitance : Principle- Capacitance of a Parallel Plate Capacitor with and Without Dielectric

Unit 2 **(5 Hours)**

Magnetism

2.1 Magnetic Field - Force on a Charge in a Magnetic Field - Force on a Charge in an Electro Magnetic Field (Lorentz Force) - Maxwell's Electromagnetic Equations (no derivations) - Physical Significance of the Equations.-Magnetic Properties of Materials - Relation Between Relative Permeability and Susceptibility

2.2 Hysteresis- Magnetometer Method of Drawing Hysteresis Curve - Energy Laws – Retentivity - Coercivity - uses of Hysteresis Curves

Unit 3 **(5 Hours)**

Electromagnetism

3.1 Force on a Current Carrying Conductor in a Magnetic Field – Moving Coil Ballistic Galvanometer - Figure of Merit of Ballistic Galvanometer for Charge and Current Sensitivity

Unit 4 **(10 Hours)**

Modern Physics

4.1 MASER : Description and working of Ammonia MASER
LASER : LASER Action – Population Inversion – Carbon Dioxide LASER Applications

4.2 Holography : Principles – Preparation of Holograms Applications- Fibre Optics : Principles – Characteristics – Classification – Applications

Unit 5 **(13 Hours)**

Electronics

5.1 Introduction to Amplifiers - Operational Amplifier - Ideal Op - Amp - CMRR - Inverting and Non- Inverting Op-Amp – Summing - Difference - Integral and Differential Op - Amp.

5.2 Boolean Algebra- De Morgan's Theorem – Verification. Algebraic Simplification – Implementation of Boolean Algebra into Circuits

BOOKS FOR STUDY

Mehta, V.K. *Principles of Electronics.* New Delhi: S Chand , 2014.
Murugeshan.R. *Modern Physics,* New Delhi: S Chand, 2013.
Subrahmanyam, N. and Lal Brij. *A Text Book of Electricity and Magnetism*. Agra: Ratan Prakash, 1994.

BOOKS FOR REFERENCE

Haliday, David and Robert Resnick. *Physics Vol.* II. Chennai: New Age, 1995.
Kakani, S L, and Bhandari K C. *A Text Book of Optics.* New Delhi: Sultan Chand, 2002.
Laud .B.B. *Lasers and Non – Linear Optic.* New Delhi: Wiley Eastern, 1991.

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Offered by the Department of Physics to the Students of Chemistry

SYLLABUS
(Effective from the academic year 2019–2020**)**

PHYSICS PRACTICAL II

CODE:19PH/AC/P242 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Rigidity Modulus 'G' By Static Torsion
2. Newton's Rings – Determination of Radius of Curvature of a Lens
3. Spectrometer – Grating – Normal Incidence - Determination of Wavelengths (λ)
4. Joule's Calorimeter – Determination of Specific Heat of a Liquid – Half Time Correction
5. Potentiometer – Ammeter Calibration (Low Range)
6. OP AMP- Inverting And Non Inverting Amplifier
7. Specific Heat Capacity of A Solid – Method of Mixtures
8. Carey Foster's Bridge –Determination of Specific Resistance
9. Coefficient of Viscosity – Absolute Determination

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examinations:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

SYLLABUS
(Effective from the academic year 2019 - 2020)

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

Unit 1 **(13 Hours)**

Legal Literacy

1.1 Structure of Government- Central and State, Urban and Rural
1.2 Laws pertaining to Women (CEDAW) and Children (POCSO)
1.3 Right to Information Act 2005, drafting and filing an RTI
1.4 Introduction to PIL, Landmark PIL cases -Vishaka Vs. State of Rajasthan, Hussainara Khatoon Vs. State of Bihar, MC Mehta Vs. Union of India
1.5 Importance of FIR and lodging an FIR

Unit 2 **(13 Hours)**

2.1 Understanding Self

2.1.1 Psychological wellbeing - meaning, components and barriers
2.1.2 Gratitude- meaning, nature and expression
2.1.3 Resilience- meaning, nature, benefits and simple techniques for building resilience.

2.2 Understanding Society

2.2.1 Concepts of class, caste, gender, disability, race, culture, religion, ethnicity, context and language

2.2.2 Importance of societal analysis

2.2.3 Social indicators of development – HDI, GDI, Poverty Index, Hunger Index

2.2.4 Issues and challenges for social change in India

Unit 3 (13 Hours)

Personal Financial Planning

3.1 Meaning, Need and Importance of Personal Financial Planning

3.2 Core concepts in Financial Planning – Budget, Savings and Investment

3.3 Converting non-essential expenditure into Savings and Investment

3.3.1 Forms of Savings – Deposits, Insurance

3.3.2 Types of Investments – Securities, Real Estate and Gold

3.4 Digital transformation in Finance

3.4.1 De-Mat Account

3.4.2 Net Banking and Mobile Banking

BOOKS FOR REFERENCE

Agarwal, R.C. Constitutional Development and National Movement of India. New Delhi: S. Chand, 1988.

Ahuja Ram. Social Problems in India. Rawat Publications. 3rd Edition, 2014

Allan, R. Modern Politics and Government. New York: Palgrave MacMillan, 2000.

Baumgardner, S., & Crothers, M. Positive Psychology. Chennai: Pearson. 1st Edition,2015.

Grenville-Cleave, B. *Positive Psychology A practical Guide*. United Kingdom: Icon Books Ltd, 2012.

Pandey, J.N. Constitutional Law of India. Allahabad: Central Law Agency, 2014.

Weiner, M. The Indian Paradox. New Delhi: Sage , 1989.

PATTERN OF ASSESSMENT

Continuous Assessment: **Total Marks: 50**

Two to three Task based components

Task based classroom activities

Case studies

Group discussions

Group presentation

Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH – III – PHYSICS

SYLLABUS

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

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.

Unit 1 (10 Hours)

Central Processing Unit (CPU)

1.1 Bus Structure - Address, Data and Control System Bus - Memory and I/O Interface Block Diagram - CPU 8085

1.2 Architecture: General Purpose Registers, ALU, Accumulator, Program Counter, Instruction Register, Stack, subroutines, Push/Pop Operations, Flag Register.

Unit 2 (10 Hours)

Addressing Modes and Instruction Set

2.1Addressing Modes: Direct, Register, Immediate, Register in-Direct Addressing Modes

2.2 Instruction Set: Data Transfer Group, Arithmetic Group, and Logic Group Instruction

2.3 Timings of 8085 - fetch and execute cycle.

Unit 3 (10 Hours)

Software Program

3.1 Arithmetic Operations: Addition, Subtraction, Multiplication and Division of Single Byte Numbers - Square Root of a Positive Single Byte Number

3.2 Sorting an Array in Ascending / Descending Order

Unit 4 **(10 Hours)**

Interfacing I/O devices and Interrupt Circuit

4.1 Type of Interfacing Devices: Address Decoding for I/O - Input and Output Ports

4.2 8085 Interrupt Circuit-Restart Instructions - Hardware Interrupts - Interrupt Priorities

Unit 5 **(12 Hours)**

Microcontrollers and Embedded systems

5.1 Micro-Controller - 8051 - Architecture-Applications

5.2 Embedded System Concept - Embedded Microcontroller Pic Series - Applications

BOOKS FOR STUDY

Ramesh Gaonkar. *Microprocessor Architecture, Programming and Applications with the 8085.* New Delhi: Penram, 2013.

Adithya .P. Mathur. *Introduction to Microprocessors.* New Delhi: Tata McGraw Hill, 2017.

Vahid Frank and Givargis Tony. *Embedded System Design-Unified Hardware Software Introduction.* New Delhi, John Wiley, 2002.

BOOKS FOR REFERENCE

Vijayendran, V. *Fundamentals of Microprocessor- 8085 Architecture Programming and Interfacing.* Chennai: S. Viswanathan, 2006.

Er.R Gopalsamy. *Microcontroller.* Madurai: Veni, 2004.

Ghosh,A.K., and P.K. Sridhar. *0000 to 8085 Introduction to Microprocessor for Engineers and Scientists.* New Delhi: PHI, 1995.

Kenneth J. Ayala. *8051 Microcontroller – Architecture, Programming and applications.* New Delhi: Penram, 1996.

Mohammed Rafi Qubbaman. *Microprocessors and Microcomputer – Based System Design.* New Delhi: UBS, 1986.

Rajkamal. *Microcontroller, Architecture, Programming, Interfacing and System Design*. U. K: Pearson, 2005.

JOURNALS

Elsevier - Journal of Microprocessors and Microsystems: Embedded Hardware Design

WEBRESOURCES

http://www.phy.davidson.edu/FacHome/dmb/py310/8085.pdf

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)
Multiple Choice Questions- 10x1=10
Fill in the blanks 5x1 = 5
Short answer 5x2 = 10
Section B (5x6=30)
Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)
Section C (3x15=45)
Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS
(Effective from the year 2019–2020**)**

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

Unit 1 **(11 Hours)**

Crystal Bonding

1.1 Bonding in Solids – Bond Energy- Bond Length-Types of Bonding –Primary Bonds- Ionic Bonding – cohesive energy of Ionic solids.

1.2 Covalent Bond (Qualitative Treatment Only) – Properties of Covalent Solids Metallic Bond – Properties of Metallic Solids.

1.3. Secondary bonds- Van der Waal's bond (molecular bond) – Van der Waal's Bond formation in Helium- properties of Van der Waal bonded solids- hydrogen bonding – hydrogen bond formation in water-properties of hydrogen bonded solids.

Unit 2 **(14 Hours)**

Crystal Imperfections

2.1 Classification of Imperfections- Point Defects - Schottky and Frenkel Defects – Electronic Defects- Energy of Formation of a Vacancy-Equilibrium Concentration of Schottky and Frenkel Defects in Ionic Crystals

2.2 Line Defects- Edge Dislocation- Burgers Vector- Screw Dislocation

Unit 3 **(12 Hours)**

Electrical Properties of Solid

3.1 Classical Free Electron Theory of Metals – the Free Electron Gas – Drude Lorentz Free Electron Theory – Ohm's Law – Expressions for Electrical Conductivity – Thermal Conductivity-Wiedemann and Franz Ratio

3.2 Hall Effect– Hall Voltage – Hall Coefficient – Mobility and Hall Angle – Experimental Determination of Hall Coefficient

Unit 4 (**14 Hours)**

Magnetic Properties of Solids

4.1 Different Types of Magnetic Materials– Langevin's Theory of Diamagnetism (Qualitative Treatment Only)–Langevin's Theory of Paramagnetism-Curie's Law-Failure of Langevin's Theory-Weiss Theory of Paramagnetism-Curie-Weiss Law

4.2 Ferromagnetism-Domain Theory of Ferromagnetism- Exchange Energy-Magnetic Energy-Anisotropic Energy-Domain Wall-Hysteresis Loop of a Ferro Magnetic Material-Explanation of Hysteresis with Domain Theory- Antiferro and Ferrimagnetic Materials- Application of Ferromagnets .

Unit 5 **(14Hours)**

Superconductivity

5.1 Introduction – experimental survey – effect of magnetic field – magneticproperties of superconductors – perfect diamagnetism or the Meissner effect – type I and type II superconductors – isotope effect

5.2 Thermodynamic effects – entropy, specific heat, thermal conductivity – energy gap –electrodynamics of superconductors – first and second London equations drawback of London theory

5.3. Qualitative explanation of BCS theory of superconductivity – application of superconductors.

BOOKS FOR STUDY

Ilangovan. K. *Solid State Physics.* Chennai: S.Viswanathan 2013.
S.O. Pillai. *Solid State Physic. New Delhi:* MJP Publishers 2011.
Singhal, R.L. *Solid State Physics.* Meerut: K. Nath, 2015.

BOOKS FOR REFERENCE

Dr.Rita John. *Solid State Physic. New Delhi:* McGraw Hill, 2010.
Saxena, B.S., R.C. Gupta and P.C. Saxena. *Fundamentals of Solid State Physics,* Meerut: Pragati, 2001.
Azarof Leonid. V. *Introduction to Solids.* New Delhi: Tata McGraw Hill, 2002.
Charles Kittel. *Introduction to Solid State Physics.* Singapore: Kin Keong, 2005.
Ali Omar M.. *Elementary Solid State Physics.* New Delhi: Replik, 2006.
Saxena. H.C. and Agarwal. K.*L. Principles of Electronics and Solid State Physics.* Agra: Ravi, 2005.

JOURNALS

Journal of Solid State Physics — An Open Access Journal
Solid State Sciences - Journal - Elsevier

WEBRESOURCES

www.solid.phys.ethz.ch/
www.springer.com › Home › Materials

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086

B.Sc. BRANCH III – PHYSICS

SYLLABUS

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

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

Unit 1 **(13 Hours)**

Electrostatics

1.1 Electrostatic Field - Coulomb's Law – Divergence and Curl of Electrostatic Field – Gauss's Law – Application – Cylindrical Charge Distribution

1.2 Electric Potential - Poisson's Equation – Laplace's Equation – Work Done in Moving a Charge – Energy of a Point Charge Distribution - Energy of a Continuous Charge Distribution – Electrostatic Boundary Conditions

Unit 2 **(13 Hours)**

Electrostatic Fields In Matter

2.1 Polarisation - Induced Dipoles – Alignment of Polar Molecules

2.2 Capacitors - Parallel Plate Capacitors-Field Inside a Dielectric – Gauss's Law in the Presence of Dielectrics – Spherical Capacitor – Capacitance of two wires – Cylindrical Capacitor.

Unit 3 **(15 Hours)**

Magnetostatics

3.1 Biot – Savart Law – Steady Currents – Magnetic Fields due to Steady Currents Flowing (i) in a Long Straight Wire at a Point Near it (ii) Along a Circular Coil at a Point on Its Axis (iii) Along a Solenoid at a Point on its Axis- Divergence and Curl of **B**.

3.2 Ampere's Law – (I) Magnetic Field at a Point Near a Long Straight Wire Carrying Steady Current. – (Ii) Magnetic Field of a Long Solenoid (Iii) Magnetic Field of a Toroidal Coil – Comparison of Magnetostatics and Elelctrostatics

3.3 Lorentz Force – Gauss law in magnetostatics-Ballistic galvanometer-dead beat and BG conditions-damping-applications of BG.

Unit 4 **(12 Hours)**

Magnetostatic Fields in Matter

4.1 Magnetic Properties of Materials – Torque and Forces on Magnetic Dipoles– Magnetization

4.2 Linear and Non-Linear Media – Magnetic Susceptibility – Magnetic Field and its Equations (I) $B = \mu_o (H+M)$ (Ii) $\mu = \mu_o (1+\chi_M)$ (Iii) $\mu_x = 1+\chi_M$ - Hysteresis – Energy Loss in Hysteresis loop.

Unit 5 **(12 Hours)**

Electrodynamics

5.1 Faraday's Laws - Electromagnetic Induction - Inductance - Self Inductance - Mutual Inductance - Energy in Magnetic Fields – Relation between Self-inductance and Mutual inductance.

5.2 Maxwell's Equations in vacuum and medium - Maxwell's Equations and Magnetic Charge - Maxwell's Equations inside Matter - Boundary Conditions

BOOKS FOR STUDY

Tewari K.K. *Electricity and Magnetism.* New Delhi: S Chand, 1995.
Sehgal, D.L., K.L. Chopra, N.K. Sehgal. *Electricity and Magnetism.* New Delhi: Sultan Chand, 1992.

BOOKS FOR REFERENCE

Halliday David, Resnik Robert and Walker Jearl. *Fundamentals of Physics.* New Delhi: John Wiley, 2005.
Chattopadhyay D., and Rakshit P.C. *Electricity and Magnetism*. Kolkata: New Central Book Agency, 2005.
Griffiths David J. *Introduction to Electrodynamics.* New Delhi: Prentice, 1997.
Mahajan A.S and A. A Rangwala. *Electricity and Magnetism.* New Delhi: Tata McGraw Hill,1988.

JOURNALS

Journal of Magnetism and Magnetic Materials - Elsevier
www.journals.elsevier.com/journal-of-magnetism-and-magnetic-materials
Student Science Journal: Electricity and Magnetism
www.planetseed.com › Science › Student Science Journal

WEB RESOURCES

Electricity and Magnetism | Physics | MIT OpenCourseWare
ocw.mit.edu › Courses › Physics
Science Center Spectrum - Electricity and magnetism
www.sdtb.de/Electricity-and-magnetism.1107.0.html

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020**)**

EXPERIMENTAL PHYSICS V

CODE:19PH/MC/P552 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Spectrometer – i– d Curve.
2. Spectrometer - Solar Spectrum
3. Ballistic Galvanometer –Coefficient of Mutual Inductance
4. Air wedge - Determination of thickness of wire
5. Field along the Axis– Determination of m and M
6. Polarimeter – Determination of Specific Rotatory Power
7. Carey Foster's Bridge- Verification of Laws and Specific Resistance.
8. Potentiometer – Calibration of High Range Voltmeter
9. Young's |Modulus – Koneig's Method

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.
Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year **2019-2020**)
EXPERIMENTAL PHYSICS VI

CODE:19PH/MC/P652 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Flasher using relay – 555 Timer
2. Study of Waveforms - Differentiator and Integrator using IC 741.
3. Light to frequency converter
4. Temperature to Voltage converter
5. OP AMP –Adder, Subtractor, Inverting and Non- Inverting, Source follower and Multiplier.
6. Half adder and half subtractor using NAND and NOR gates
7. 4 bit Binary adder
8. Microprocessor application – Arithmetic operation (8 bit)- addition, subtraction, multiplication and division
9. Microprocessor application- sorting an array in ascending and descending order

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007

Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

Sathian G. Kumar, (2006), *Computer Science - Manual for Digital Electronics and Microprocessor Lab.*

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Interdisciplinary Core Course Offered by the Departments of Physics and Economics to B.Sc. Physics and B.A. Economics Degree Programmes

SYLLABUS

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

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

Unit 1 **(15 Hours)**

Energy Resources

1.1 Energy routes for non- renewable energy resources – age renewables and alternatives – moving towards renewable energy sources- energy conservation practices.

1.2 Types of energy sources- Renewable and Non –Renewable sources.

1.3 Energy developments – energy requirements and future prospects.

1.4 Energy consumption - energy consumption (per capita) & economic growth

1.5 Global energy consumption - energy demand - primary energy demand and cumulative energy demand

Unit 2 **(17 Hours)**

Solar Energy

2.1 Fundamentals of solar radiation – nature of solar radiation – radiation on earth's surface – sun path chart.

2.2 Photovoltaics – principles – physics and operation of solar cells – solar panels- solar power plants.

2.3 fundamentals of solar collectors – conversion of solar energy to heat energy – applications - solar cooking- solar water heaters.

Unit 3 **(16 Hours)**

Wind energy

3.1 Introduction – basic principles of wind energy conversion.

3.2 Nature of wind – power in the wind -, forces on the blades and wind energy conversion – site selection

3.3 Classification of wind energy conversion systems – advantages and limitations.

Unit 4 **(15 Hours)**

Micro Foundation

4.1 Demand and supply and elasticity of renewable energy and Elasticity of Renewable energy

4.2 Consumer theory - preference and utility - Budge Constraints - Consumer Surplus

4.3 Producers theory -Producers equilibrium

4.4 Cost and revenue and pricing

4.5 Market Structure - Different Types of markets in renewable industry

Unit 5 **(15 Hours)**

Energy Decision Policies

5.1 Energy used by households and individiuals - energy consumption - energy calculation

5.2 Alternative energy - cost and benefits

5.3 Price regulations, deregulation and market - world oil markets & energy security

5.4 Public Policies - Indian environmental policies - National Solar policies & Wind (national wind-solar hybrid policy 2018)- social movements - energy efficiency policies - renewable energy policies - regulation- emission trading

5.5 Global climate change issues and responses - greenhouse gas emission and potential effects - effect on ecology and biodiversity - responses to CO2 - Carbon tax - Command and Control

BOOKS FOR STUDY

1. Ramesh R. Kumar K.U Renewable Energy Technologies , Narosa Publishing House, New Delhi, 1997.

2. Thipse. S.S. Nonconventional and Renewable energy sources, Narosa Publishing House, New Delhi, 2014.

3. G.D Rai, Solar Energy Utilization, 5th edition Khanna Publishers, 2010

4. Banks F.E Energy Economics ; A Modern Introduction, Kluwer Academic Publishers Dordrecht 2000

5. Griffin J H and H B Steel Energy Economics and Policy Academic Orlando 1986

6. Samuelson Paul A, William D Nordhaus ; Economics; 19th edition, McGraw Hill Education 2006

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Economics (25 marks)
Physics (25 marks)

Students should answer for minimum of 20 / 40 marks from each of the subjects.

Section A – 5x3= 15 (All questions to be answered)
Section B – 4x5= 20 (4 out of 5 to be answered)
Section C – 1x15=15 (1 out of 2 to be answered)

Other Components:
Seminars/Concept test/Quiz/Assignments/Case studies/Project

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Economics (50 marks)
Physics (50 marks)

Question Paper Pattern:
Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086

B.Sc. DEGREE : BRANCH III - PHYSICS

SYLLABUS

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

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

Unit 1 **(10 Hours)**

Circuit Analysis

1.1 Linear Circuit Analysis - Open and Short Circuits - the Voltage and Current Divider Circuit

1.2 Superposition Theorem - Transfer Theorems – Thevenin's Theorems – Norton's Theorem

Unit 2 **(12 Hours)**

Transistor Amplifiers

2.1 Transistor Biasing – Voltage Divider Bias Method– Stability Factor - Operating Point–DC Load Lines

2.2 Single Stage Transistor Amplifier– Practical Circuit of Transistor Amplifier – Multistage Transistor Amplifier - RC Coupled Transistor Amplifier (No Derivation) – Operation – Frequency Response - Advantages – Disadvantages

Unit 3 **(10 Hours)**

Special Semiconductor Devices

3.1 Field Effect Transistors – JFET – Working – Channel Conductance – Space Charge Distribution – Difference Between JFET and Bipolar Transistor – JFET as an Amplifier – IV Characteristics – Pinch Off Voltage – Parameters of JFET

3.2 Uni Junction Transistor – Construction – Operation – Inter base Resistor – Equivalent Circuit – Intrinsic Stand Off Ratio – IV Characteristics – Peak Voltage Valley Current – Valley Voltage Negative Resistance Region – Relaxation Oscillator

Unit 4 **(10 Hours)**

Operational Amplifier

4.1 Differential Amplifier – CMRR – Operational Amplifier - Functional Diagram – Virtual Ground – Non Inverting – Inverting Modes of Operation – Gain Equation

4.2 Operational Amplifier Application – Adder- Subtractor - Scale and Sign Changer – Differentiator – Integrator – Voltage Follower- Comparator.
Electronic Analog Computation – Solution of Simultaneous Equations – Differential Equation

Unit 5 **(10 Hours)**

D/A and A/D converters

5.1 Weighted resistor D/A converter – R – 2R ladder D/A converter – parallel A/D converter

5.2 A/D conversion by counter method - A/D conversion using voltage to frequency converter.

BOOKS FOR STUDY

Gayakwad R.A. *Op. Amps & Linear Integrated Circuits.* New Delhi: Prentice, 2015.
Malvino Albert Paul and Leach Donald. *Digital Principles and Applications.* New Delhi: Tata McGraw Hill, 2014.
Malvino Albert Paul. *Electronic principles.* New Delhi: Tata McGraw Hill, 1999.
Mehta, V. *Principles of Electronics*. New Delhi: S Chand, 2014.
Sedha R.S. *Applied Electronics.* New Delhi: S Chand, 2008.

BOOKS FOR REFERENCE

Allen Mottershead. *Electronic Devices and Circuits.* New Delhi: Prentice, 1982.
Ambrose A & T Vincent Devaraj. *Elements of Solid State Electronics.* K.K. Dist: Meera 1990.
Floyd Thomas L. *Digital Fundamentals.* New Delhi: Universal, 1997.
Milmann and Halkias. *Integrated Electronics.* New Delhi: Tata McGraw Hill, 1992.

JOURNAL

IOSR – Journal of Electrical and Electronics Engineering. (IOSR – JEEE)

WEBRESOURCE

www.Electronics.com/

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes
Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3
Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)
Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086

B. Sc. DEGREE: BRANCH III - PHYSICS

SYLLABUS

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

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

Unit 1 (13 Hours)

Positive rays and photoelectric effect

1.1 Positve rays- Aston's mass spectrograph-Dempster's mass spectrograph. Photoelectric effect: Introduction-photoelectric laws-laws of photoelectric effect-Einstein's photoelectric equation-experimental verification of Einstein's photoelectric equation-Millikan's experiment-photoelectric cells.

1.2 Production of X-rays-Bragg's law-Bragg's spectrometer-X-ray spectra-continuous and characteristic X-ray spectrum-Moseley's law-Compton effect-experimental verification

Unit 2 (13 Hours)

Atom model

2.1 Excitation and ionization potentials-vector atom model-spatial quantization-spin quantum number associated with vector atom model- shell character-electronic structure-selection rules-electronic configuration-experimental confirmation of the vector atom model- Stern- Gerlach's experiment-Bohr magneton.

2.2 Zeeman effect-experimental arrangement of the normal Zeeman effect-expression for the Zeeman shift-Paschen Back effect-Stark effect.

Unit 3 (13 Hours)

Nucleus and Radioactivity

3.1 Nuclear Density - Binding Energy Per Nucleon - Packing Fraction - Nuclear

Stability - Magnetic Moment - Nuclear Radius - Nuclear Charge - Nuclear Force - Meson Theory of Nuclear Force

3.2 Relation between half-life and mean life – Law of Disintegration - Alpha Decay - Tunneling Effect - Range of Alpha Article- Geiger Nuttal Law- Fine Structure - Beta Decay – K Electron Capture - Fermi Neutrino Theory - Beta Energy Spectrum, Gamma Decay – Principles of Internal Conversion - Interaction of Gamma Ray with Matter - Units of Radioactivity - Radiation Effects

Unit 4 **(13 Hours)**

Nuclear Energy

4.1 Nuclear reactions – Q value, threshold value – endoergic reaction, artificial radioactivity, radioisotopes, uses

4.2 Nuclear fission – chain reaction – controlled and uncontrolled, multiplication factor – four factor formula, power reactors, reactors in India, nuclear fusion, thermonuclear reaction, C- N cycle, proton – proton cycle, plasma – Nuclear Magnetic bottle.

Unit 5 **(13 Hours)**

Elementary Particles and Nuclear Resonance

5.1 Elementary Particles - Leptons - Mesons - Baryons - Fundamental Interactions - Their Strength – Antiparticle - Strange Particles - Quarks, Conservation Laws

5.2 Cosmic Rays Introduction – Neutrino – Van Allen Belt.

BOOKS FOR STUDY

Murugesan .R. Modern Physics. New Delhi: S Chand and Company Ltd., Eighteenth Edition 2016.

Gupta A. B. and Dipak Ghosh. Atomic and Nuclear physics. Calcutta: Books and Allied,. 1999.

BOOKS FOR REFERENCE

Beiser, Arthur. *Concepts of Modern Physics.* New Delhi: Tata McGraw Hill, 2004.

Chang, Raymond, , *Basic principles of Spectroscopy***,** New Delhi: Tata McGraw Hill, 1971.

Ilandovan. K. *Nuclear Physics*. Chennai: MJP, 2012.

Littlefield, T A and Thorley N. *Atomic and Nuclear Physics – an Introduction*. London: Van Nostrand, 1979.

Rajam J. B. *Atomic Physics*. New Delhi: S Chand, 2000.

Ronald Gautreau and William Savin. *Schaum's Series*. New Delhi: Tata McGraw Hill, 2004.

Sanjiv Puri. *Modern Physics – Concepts and Applications.* New Delhi: Narosa, 2009.

Journals

Journal of Nuclear Physics

Physics Letters B: Nuclear, Elementary and High Energy Physics

Nuclear Engineering and Design

Web resources

www. Journal of nuclear Physics.com

Scienceenergy.gov/np

www.saha.ac.in

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE : BRANCH – III – PHYSICS

SYLLABUS

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

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.

Unit 1 (12 Hours)

Wave like Properties of Particles

1.1 Wave-Particle Duality-De Broglie hypothesis for matter waves-De Broglie Wavelength-Davisson and Germer Experiment.

1.2 Uncertainty Principle- Einstein's Interpretation of Duality for Radiation- Wave Functions- Superposition Principles

1.3 Properties of Matter Waves- Relation Between Wave, Group and Particle Velocities

Unit 2 (12 Hours)

Schrödinger's Equations and Applications

2.1 Time Independent Schrödinger's Equation

2.2 Applications to One Dimensional Problem: Particle in a One Dimensional Box- the Step Potential Rectangular Potential Barrier- Examples of Barrier Penetration by Particles

2.3 Application to Three Dimensional Problems: the Free Particle- Particle in Three Dimensional Box- Degeneracy

2.4 Introduction to Time Dependent Schrodinger Equation – Qualitative aspects.

Unit 3 **(14 Hours)**

Quantum Mechanical Operators

3.1 Definition of an Operator- Operator Algebra- Eigen Values and Eigen Functions

3.2 Commutation Relation between Momentum and Free Particle Hamiltonian Operators

3.3 Linear Operators- Hermitian Operators- Properties- Parity Operators- Properties- Commutation Relation between Parity and Symmetric Hamiltonian Operators

Unit 4 **(13 Hours)**

Relativity

4.1 The Experimental Background of the Theory of Relativity- Galilean Transformations- Newtonian Relativity

4.2 Michelson-Morley Experiment- Explanation of Negative Results- Postulates of Special Theory of Relativity

4.3 Inertial and Non-inertial frame of reference.

Unit 5 **(14 Hours)**

Relativistic Mechanics

5.1 Relativistic Kinematics - Lorentz Transformation Equation (Derivation) – Consequence of Lorentz Transformation Equation (i) Length Contraction (ii) Time Dilation Experimental Verification of Length Contraction and Time Dilation Concepts- Meson Paradox- Twin Paradox

5.2 Relativistic Mechanics - Relativistic Energy and Momentum

5.3 Mass - Energy Equivalence- Evidence in Support of Mass- Energy Relation between Momentum and Energy

BOOKS FOR STUDY

Kamal Singh, S.P.Singh. *Elements of quantum mechanics.* New Delhi: S Chand, 2005.

Gupta S.L., V. Kumar, H V Sharma, R C Sharma. *Quantum Mechanics.* Meerut: Jai Prakash Nath, 2004.

Prakash Sathya. *Relativistic Mechanics.* Meerut: Pragathi, 2017.

BOOKS FOR REFERENCE

Beiser Arthur. *Concepts of Modern Physics,* New Delhi: Tata McGraw Hill, 2004.

Eisberg Robert, Robert Resnick. *Quantum Physics.* New York: John Wiley, 2002.

Mathews P.M. *A Text Book of Quantum Mechanics.* New Delhi:. Tata McGraw Hill, 1976.

JOURNAL

International Journal of Quantum Information (World Scientific)

Quantum Physics News - Phys.org

WEB RESOURCE

www.quantumrelativity.com/

phys.columbia.edu/~cqft/physics.htm

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 17 Marks (All questions to be answered) in 20 minutes

Multiple choice – 7, Fill in the blanks – 4, Answer briefly – 3

Section B – 3 x 6 = 18 Marks (3 out of 4 to be answered (2 problems & 2 theory)

Section C – 1 x 15 = 15 Marks (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Seminar/Presentation/Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A (25 Marks)

Multiple Choice Questions- 10x1=10

Fill in the blanks 5x1 = 5

Short answer 5x2 = 10

Section B (5x6=30)

Answer any FIVE questions (5x6=30) (5 out of 7 to be answered, 5 problems & 2 theory)

Section C (3x15=45)

Answer any THREE questions (3x15=45) (3 out of 5 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020)

EXPERIMENTAL PHYSICS VII

CODE:19PH/MC/P762 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. Spectrometer - narrow angled prism
2. Spectrometer : i –i' curve of a prism.- Stoke's formula
3. Field along the axis – Searle's Vibration Magnetometer
4. Potentiometer – Comparison of EMF and Internal Resistance
5. Hysteresis – Magnetometer method – B-H curve
6. Ballistic Galvanometer – Comparison of Mutual Inductance
7. Carey Foster's Bridge- Temperature Coefficient
8. Copper Voltameter – Determination of E.C.E of Copper – T. G
9. Specific Heat Capacity of Liquid – Method of Mixtures.- Barton's Correction

BOOK FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II.* Chennai: S.Viswanathan, 2007.

Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks : 50**	**Duration : 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. PHYSICS : BRANCH III – PHYSICS

SYLLABUS
(Effective from the Academic year 2019-2020)
EXPERIMENTAL PHYSICS – VIII

CODE:19PH/MC/P862 **CREDITS:2**
L T P:0 0 3
TOTAL HOURS:39

1. R – 2R ladder - D/A Converter
2. Sine wave generation - Phase shift oscillator
3. Karnaugh map simplification
4. Astable multivibrator using 555 Timer
5. Data Selector – Study of multiplexer.
6. BCD Adder (7483)
7. Decade Counter (7490)
8. Ripple counter
9. Microprocessor - HEX to BCD and BCD to HEX conversion.

BOOKS FOR STUDY

Ouseph,C. C., V. Srinivasan and R. Balakrishnan, *A Text Book of Practical Physics. Vol. I & II*. Chennai: S.Viswanathan, 2007

Chattopadhyay, D. and Rakshit, P. C, *An Advanced Course in Practical Physics,* New Central Book Agency; 10th Revised Edition, 2011

Sathian G. Kumar, (2006), *Computer Science - Manual for Digital Electronics and Microprocessor Lab.*

PATTERN OF ASSESSMENT

Continuous Assessment Test:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

End-Semester Examination:	**Total Marks: 50**	**Duration: 3 hours**
Formula & Procedure	20	
Observation & Calculation	20	
Result & Accuracy	10	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF VALUE EDUCATION

SYLLABUS

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

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 religious 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

Unit 1

Spiritual Self **(10 Hours)**

1.1 Understanding spirituality-Understanding the Spiritual side of oneself

1.2 Role of religious practices and growing in spirituality

1.3 Acceptance of self – self-identity, self-worth, self-respect, self-appreciation and self- presentation

1.4 Nurturing self - being at home with self, being able to connect with the inner self

1.5 Relationship with the Divine:
Discovering the Divine in self, creation, and others – St. Francis of Assisi- Canticle of creatures Seeking the Divine through meditation, prayer and worship

Unit 2

Relational Self: Women in the family **(17 Hours)**

2.1 Understanding one's self in the context of family

2.2 Family networks

2.3 Family time – prayer, meals, and relaxation

2.4 Family and social values: respect for others, understanding individual needs and responsibilities – give and take
2.5 Understanding different parenting styles – authoritarian, permissive and democratic
2.6 Appreciating the gift of womanhood – foundress-Mary of the Passion's vision of womanhood
2.7 Opting for marriage, single, religious or a life committed to a cause
2.8 Marriage and family, choice of life partner, marital relationships, planning of family
2.9 Other types of relationships - pre-marital relationships, live-in relationship and LGBT issues
2.10 Roles and responsibilities of women as home makers and career woman, work life balance (WLB)
2.11 Marriage as a sacred bond and fidelity in marriage

Unit 3

Integrated Self **(12 Hours)**

3.1 Integrating the spiritual, relational, social/political self
3.2 Integrating one's past with the present and the future for holistic living
3.3 Social Issues- crimes against women, harassment, gender discrimination, dowry, abortion, separation, divorce and cyber-crimes
3.4 Legal rights of women-property, marital and adoptive rights
3.5 Sensitization to different religions and religious practices in family and society
3.6 Challenges of inter caste and inter religious marriages
3.7 Integration of self with family, community and society

Retreat/Workshop – Required for course completion.

BOOKS FOR REFERENCE

Davidar(Eds). Human Values. All India Association of Christian Higher Education. (AIACHE) New Delhi: 2013.

James, G.M. et.al. In Harmony-Value Education at College Level. Chennai: Prakash, 2011.

James, G.M. Personality Development For Life Issues and Coping Strategies. Chennai: 2011

Teaching / Learning Methods

Lectures /Group Discussions/Presentations/Seminars/Guest Lectures

PATTERN OF ASSESSMENT: **Marks: 50**

Task based/Seminars/Poster Making/Scrap book/Assignment

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS

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

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

Unit 1 **(13 Hours)**

Introduction to Nanoscience and Nanotechnology

1.1 Introduction- Nano and Nature- Scientific Revolution, Definition of Nanotechnology, Emergence of Nanotechnology

1.2 Bulk to Nano Transition- Nanosize Effects - Size Dependent Phenomena - Bohr Excitonradius, Quantum Confinement

Unit 2 **(13 Hours)**

Types of Nanostructures and Functional Nanomaterials

2.1 Definition of a Nano System - Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) Nanostructured Materials - Quantum Dots (0 D) - Quantum Wire - Core/Shell Structures

2.2 Carbon (Fullerene, CNT, Graphene), Noble Metals (Au, Ag), Metal Oxides (Tio_2, Sno_2, Zno), Semiconductors (Cds, Cdse, Cdte), Magnetic Nanoparticles, Semiconductor Nanocomposites (Si:Ge)

Unit 3 **(13 Hours)**

Synthesis of Nanomaterials

3.1 Physical Method: Ball Milling, Sputter Deposition, Ion Beam Techniques.

3.2 Chemical Method: Wet Chemical Synthesis – Sol-Gel Processing, Co-Precipitation, Hydrothermal, Chemical Bath Deposition

3.3 Vapour Method: Thermal Evaporation - Chemical Vapor Deposition (CVD)

Unit 4 **(13 Hours)**

Characterisation Techniques

4.1 Powder X-Ray Diffraction

4.2 UV-Vis Absorption Spectroscopy-Photo Luminescence

4.3 Scanning Electron Microscopy(SEM)- Transmission Electron Microscopy(TEM)

Unit 5 **(13 Hours)**

Applications of Nanomaterials

5.1 Applications in Physics: Nanoelectronics, Quantum Dot and Dye Sensitized Solar Cells, Photovoltaics, Photocatalytic Applications, CNT Based Transistor and Field Emission Display

5.2 Applications in Other Fields of Science: Nanosensors, Nanomedicine, Nanocoatings, Nanopaints

BOOKS FOR STUDY

GuoZhong Cao. *Nanostructures and Nanomaterials.* U.K: Imperial College Press, 2004.
Viswanathan. B. *Nano Materials.* India: Narosa, 2010.
Pradeep T. *Nano: The Essentials.* New Delhi: Tata Mcgraw Hill, 2007.

BOOKS FOR REFERENCE

John D. Miller. *A Hand Book on Nanophysics.* India: Dominant, 2008.
Charles P. Poole, Jr., Frank J. Owens. *Introduction to Nanotechnology*. New Delhi: Wiley, 2009.
Mick Wilson, Kamalikannangora Geoff Smith, Michelle Simmons, Burkhard Raguse. *Nanotechnology- Basic Science and Emerging Technologies*. New Delhi: Overseas, 2005.

JOURNALS

American Chemical Society publishers
Journal of Physical Chemistry (Review articles)
Chemical Reviews
Springerlink Publishers
Journal of Nanoparticle Research
Elsevier Publishers
Nano Today

WEBRESOURCE

http://www.slideshare.net/MazharLaliwala/introduction-to-nanoscience-and-nanotechnology

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 5x3= 15 (All questions to be answered)
Section B – 4x5= 20 (4 out of 5 to be answered)
Section C – 1x15=15 (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Project/Assignments/Seminar

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

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

B.Sc. DEGREE: BRANCH III –PHYSICS

SYLLABUS
(Effective from the academic year 2019-2020)

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.

Unit 1 **(13 Hours)**

Basic Theory

1.1 Quantum Nature of Light – Energy Levels – Thermal Equilibrium - Population-Population Inversion - Absorption – Spontaneous and Stimulated Emission – Condition for Stimulated Emission

1.2 Einstein's Coefficients – Relation Between Them – Schawlow -Towne's Threshold Condition for Laser Oscillations in Terms of Population Difference

1.3 Basic Components of a Laser- Active Medium- Pumping Agents- Different Pumping Methods- Optical Resonator- Action of Optical Resonator- Optical Resonator – Cavity Configuration - Plane Parallel Cavity-Confocal Cavity-Hemispherical and Long Radius Cavity

Unit 2 **(16 Hours)**

Rate Equations and Solid State Lasers

2.1 Laser Rate Equation- Two Level System- Three Level System- Four Level System (Qualitative Treatment Only)-Qualitative Explanation of Line Broadening Mechanism

2.2 Classification of Lasers (on the Basis of Active Medium) - Solid State Laser -Nd: YAG Laser–General Description-Structure- Energy Level Diagram – Working

2.3 Laser Beam Characteristics – Introduction- Directionality-Divergence-Coherence- Temporal and Spatial Coherence- Monochromaticity

Unit 3 **(10 Hours)**

Gas and Liquid Lasers

3.1 Gas Lasers–Molecular Gas Laser (Helium Neon laser and Carbon Dioxide Laser)-General Description-Structure - Energy Level Diagram – Working

3.2 Liquid Laser – Dye Laser - Description - Energy Level Diagram – Working

3.3 Chemical Laser– HCl Laser- HF Laser

Unit 4 **(13 Hours)**

Semiconductor Laser and Holography

4.1 Semiconductor Laser – Intrinsic Semiconductor Laser - Doped Semiconductor Laser

4.2 PN Junction– Population Inversion-Energy Level Diagrams- Homojunction Laser- Diode Laser Operation- Advantages of Laser Diodes over LED

4.3 Introduction to Holography –Recording and Reconstruction of the Image - Characteristics – Applications in Holography

Unit 5 **(13 Hours)**

Applications

5.1 Laser in Industry – Drilling - Cutting – Welding – Laser Printing - Lasers in Nuclear Energy – Isotope Separation – Nuclear Fusion- Lasers in Defense- Lidar – Precision Length Measurement – Velocity Measurement

5.2 Lasers in Medicine – Cancer Therapy– Laser Eye Surgery- Laser Angioplasty

5.3 Lasers in Consumer Electronics Industry –Bar Code Scanners - Lasers in Communications-Block Diagram-Basic Principles of Optical Computers-Laser Ablations.

BOOKS FOR STUDY

Avadhanulu .M.N. Hemne P.S *Introduction to Lasers.* New Delhi: S Chand, 2017.
Laud B.B. *Lasers and Non – Linear Optics.* New Delhi: Wiley, 1985.

BOOKS FOR REFERENCE

Mohan. S, Arjunan. V, M. Selvarani and M. Kanachanamala, Laser Physics MJp Publishers, 2012.
Thyagarajan K. & Ghatak, A.K. *Lasers*. Chennai: Macmillan, 1981.
Wison, J & Hawkes J F B. *Optoelectronics–An Introduction.* New Delhi: Prentice Hall, 1987.

JOURNALS

Laser Physics – Springer
link.springer.com/journal/11490
Journal of Laser Applications
Scitation.aip.org/content/lia/journal/jla

WEBRESOURCE

Institute of Physics - For physics • For physicists • For all ...
www.iop.org/
Laser Physics - Complete University Guide
www.thecompleteuniversityguide.co.uk › Courses › Options

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 5x3= 15 (All questions to be answered)
Section B – 4x5= 20 (4 out of 5 to be answered)
Section C – 1x15=15 (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Quiz/Open book tests/Group discussion/Assignments/Seminar/Problem solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

SYLLABUS
(Effective from the academic year 2019–2020**)**

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

Unit 1 **(13 Hours)**

Communication Principles

1.1 Types of Modulation – Amplitude Modulation – Modulation Factor –Analysis of Amplitude Modulated Wave – Energy Distribution in AM Wave

1.2 Frequency Modulation - Analysis of Frequency Modulated Wave – Phase Modulation – Comparison of Frequency and Amplitude Modulation

1.3 Pulse Amplitude Modulation – Pulse Width – Pulse Coded Modulation (Principles Only)

Unit 2 **(13 Hours)**

Radiation Propagation

2.1 Fundamentals of Electromagnetic Waves – Propagation of Waves – Ground Waves – Sky Waves – Waveguides and attenuation.

2.2 Space Wave Propagation – Effect of Earth's Curvature – Atmospheric Effects-Ionosphere and Its Stratification

Unit 3 **(13 Hours)**

RADAR Systems and Microwave Generations

3.1 Radar Systems – Basic Principles – Basic Pulsed Radar System – Block Diagram and Description – Radar Range Equation – Uses of Radar – Doppler Radar Systems

3.2 Microwave Communication – Introduction – Generation of Microwaves – Magnetron Oscillator – Working – Klystron Oscillator – Velocity Modulation– Multicavity Klystron – Reflex Klystron

Unit 4 **(13 Hours)**

Fibre Optic Communication

4.1 Introduction – Importance of Optical Fibres – Propagation of Light Waves in an Optical Fibre – Basic Structure of an Optical Fibre – Propagation of Light Wave Through an Optic Fibre – Acceptance Angle and Acceptance Cone of a Fibre – Modes of Propagation – Meridinial and Skew Rays

4.2 Classification of Optical Fibres – Fibre Losses – Attenuation in Optic Fibres- Material or Impurity Loss – Absorption Loss – Radiation Induced Losses

Unit 5 **(13 Hours)**

Basics of Wireless and Mobile Communications

5.1 Introduction - Radio Transmission Techniques- Cellular Concept - Operational Channels - Making a Call

5.2 Modern Wireless Communication Systems : First Generation Networks - Second Generation Networks - TDMA/FDD - CDMA/FDD Standard - Mobile Networks – 3G - Third Generation Networks - 4G networks- Bluetooth - Wireless Local Area Networks (W-Lan)

BOOKS FOR STUDY

Ambrose, A., T. Vincent Devraj. *Elements of Solid State Electronics,* K. K. DT: Meera 1990.

Mehta. V.K. *Principles of Electronics.* New Delhi : S Chand, 2014.

Sarkar Subir Kumar. *Optical Fibres and Fibre Optic Communication Systems.* New Delhi: S Chand, 2007.

Jochen Schiller. *Mobile Communications.* Second Edition. U.K: Pearson Education, 2008.

BOOKS FOR REFERENCE

Haykin, Simon. *Digital Communications.* New Delhi: John Wiley, 1998.

Kennedy, George. *Electronic Communication Systems.* New Delhi: McGraw, 1984.

Lathi B.P. *Communication System*. New Delhi: New Delhi: Wiley, 1981.

Kaveh Pahlavan, Prasanth Krishnamoorthy. *Principles of Wireless Networks.* First Edition. U.K: Pearson Education, 2003.

JOURNAL

AEU - International Journal of Electronics and Communications

IOSR Journal of Electronics and Communication Engineering(IOSR-JECE)

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A – 5x3= 15 (All questions to be answered)

Section B – 4x5= 20 (4 out of 5 to be answered)

Section C – 1x15=15 (1 out of 2 to be answered)

Other Components: **Total Marks: 50**

Project/Assignments/Seminar

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

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

B.Sc. DEGREE: BRANCH III –PHYSICS

SYLLABUS
(Effective from the academic year 2019-2020)

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

Unit 1 **(9 Hours)**

Introduction

1.1 Characteristics of electromagnetic spectrum – The quantization of energy – regions of the spectrum – representation of spectra – basic elements of practical spectroscopy.

1.2 Resolving power – width of spectral lines – intensity of spectral lines

Unit 2 **(14 Hours)**

Microwave Spectroscopy

2.1 Rotation of molecules - Rotational spectra - Rigid and non-rigid diatomic rotator- Intensity of spectral lines - Isotopic substitution - Poly atomic molecules (Linear, symmetric top and asymmetric top) - Hyperfine structure

2.2 Techniques and instrumentation - Chemical analysis by microwave spectroscopy

Unit 3 **(14 Hours)**

Infrared spectroscopy

3.1 Energy of diatomic molecules ‑ The simple harmonic oscillator ‑ The diatomic vibrating rotator - Vibrational rotational spectrum - Interactions of rotations and vibrations-Influence of rotation on the Vibrational spectrum of linear and symmetric top and poly atomic molecules

3.2 Techniques and instrumentation – Single and double beam Spectrophotometer – applications

Unit 4 **(14 Hours)**

Raman spectroscopy

4.1 Classical and quantum mechanical picture of Raman effect-Polarizability –Pure rotational Raman spectrum- Vibrational Raman Spectrum- Rule of mutual exclusion-Overtones and combination- Rotational fine structure - Depolarization ratio-Vibrations of spherical top molecule-structural determination from IR and Raman spectroscopy

4.2 Techniques and instrumentation – applications

Unit 5 **(14 Hours)**

Nuclear magnetic resonance spectroscopy

5.1 Introduction-Interaction of spin and magnetic field-population of energy levels-Larmor precession-Relaxation - times- Double resonance- Chemical shift and its measurement- Coupling constant-Coupling between several nuclei - Quadrupole effects-C13 NMR spectroscopy

5.2 Experimental methods - Interpretation of simple spectrum

BOOKS FOR STUDY

C. N. Banwell, Fundamentals of molecular spectroscopy, Tata Mcgraw Hill, New Delhi(2016)

H.V. Sharma,S.L. Gupta,V. Kumar , Elements of Spectroscopy Pragati Prakashan 2011

BOOKS FOR REFERENCE:

Rajat K. Chaudhuri, M.V. Mekkaden, A. V. Raveendran, A. Satya Narayanan Recent Advances in Spectroscopy:

Berman Paul R., Malinovski Vladimir S. Principles of Laser Spectroscopy and Quantum Optics Princeton University Press

PATTERN OF EVALUATION

Continuous Assessment Test : Total Marks: 50 Duration: 90 minutes

Section A – 5x3= 15 (All questions to be answered)
Section B – 4x5= 20 (4 out of 5 to be answered)
Section C – 1x15=15 (1 out of 2 to be answered)

Other Components:

Quiz/Open book tests/Group discussion/Assignments/Seminar/Problem solving

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. BRANCH III – PHYSICS

SYLLABUS
(Effective from the academic year 2019–2020)

PROJECT

CODE:19PH/ME/PR45 **CREDITS:5**

GUIDELINES FOR PROJECT

Project should be done individually. Each student will choose a topic of her interest and the student will be assigned a supervisor.

Each candidate should submit a research proposal to the Supervisor and the abstract of the project to be developed in guidance with the supervisor

The project will require practical work with the submission of a project report. It should include experimental lab work. The duration of the project work is one semester

The project report should be submitted in the prescribed format containing a minimum of 30 pages.

Each candidate has to give three periodical reviews to the internal guide on the scheduled dates prescribed by the Department

Each candidate will submit 3 hard copies of the project thesis and submit on the scheduled date. The student will appear for Viva-voce before a panel comprising External Examiner, supervisor and Head of the Department

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 50**

Periodical review and submission of reports

End Semester Examination: **Total Marks: 50**

Dissertation and Viva-Voce

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86

General Elective Course Offered by Department of Physics to B A./ B.Sc (Other than Mathematics, Physics, Chemistry) / B.V.A / B.Com. /B.B.A / B.C.A. / B.S.W. Degree Programme

SYLLABUS

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

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.

Unit 1 **(8 Hours)**

Mechanics

1.1 Newton's Laws of Motion- Conservation of Linear Momentum. Impulse-Collision- Centripetal and Centrifugal Forces –First and Second Order of Levers –Simple Machines

1.2. Experiments

I Conservation of Linear Momentum

II Centripetal and Centrifugal Forces

III Simple Machines

Unit 2 **(9 Hours)**

Optics

2.1 Light – Characteristics of Light- Reflection – Refraction – Interference – Diffraction -Polarization- Electromagnetic Spectrum- Microscope-Telescope-Spectrometer

Laser- Stimulated Emission – Principle of Laser Action

2.2 Experiments

i. Parts of Optical Instruments

ii Study of Spectrum Using Prism and Transmission Grating

iii Determination of Thickness of Thin Wire Using LASER

Unit 3 **(9 Hours)**

Electricity

3.1 Ohm's Law- Resistance in Series and Parallel- Electromagnetic Induction- Lenz's Law- Magnetic Materials- Different Types of Magnetic Materials- DC and AC- Three Phase AC

3.2 Experiments

i. Verification of Ohm's Law

ii Study of Magnetic Properties

iii Generation of EMF Using Induction Coil

BOOKS FOR STUDY

Halliday,David and Robert Resnick. *Physics Vol I and I*. Chennai: New Age, 1995.

BOOKS FOR REFERENCE

Naranyanamurthi.M and Nagaratham.N. *Dynamic*. Chennai: The National, 1994.
Subrahmanyan. Nand Lal Brij. *Textbook of Optics*. New Delhi: Vikas, 2013.
Murugeshan R. *Electricity and Magnetism*. New Delhi: S Chand, 2013.

PATTERN OF ASSESSMENT

No End-Semester Examination.

Continuous Assessment Test **Total : 25 Marks**

Section A – 5 x 3 = 15 Marks (All questions to be answered)

Section B – 2 x 5 = 10 Marks (2 out of 4 to be answered)

Other Components: **Total : 25 Marks**

Seminar/Quiz/Open book tests/Assignment/Presentation of working model

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086

General Elective Course Offered by Department of Physics to
B A./ B.Sc (Other than Mathematics, Physics, Chemistry) / B.V.A / B.Com. /B.B.A / B.C.A. / B.S.W. Degree Programme

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

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.

Unit 1 **(9 Hours)**

Basic Electric Circuits

1.1 Basic Facts : Electric Circuits – Basic Components Used in an Electric Circuit – Complete Circuit- Lighting Circuits - Series and Parallel Circuits

1.2 Switches – Types of Switches – Plugs and Its Types – Safety Practices and Measurements

Unit 2 **(9 Hours)**

Electrical Connections

2.1 Principles of Single Phase and Three Phase Connections. Fuses-Fuse Wire – Melting Point – Causes and Repairing a Fuse- the Earth Wire – Lightning Conductor

2.2 Home Appliances: Inverter - Electric Fan- Electric Iron.

Unit 3 **(8 Hours)**

Demonstration and Hands-on Training

3.1 Experiments on Closed, Open, Short, Series and Parallel Circuits.

3.2.Wiring Practice of Switches and Plugs.

3.3 Measurement of Current and Voltage Using Multimeter.

3.4.Replacing Fuses

3.5 A Model of House Wiring

3.6.Tubelight Connection

BOOKS FOR REFERENCE:

Bob Fairbrother. *Electricity in the Home.* New York: Bell and Bain, 1998.
Lindslaey Trevor. *Basic Electrical Installation Work.* Great Britain: Newnes, 2005.

PATTERN OF ASSESSMENT
No End-Semester Examination

Continuous Assessment Test **Total : 25 Marks**
Section A – 5 x 3 = 15 Marks (All questions to be answered)
Section B – 2 x 5 = 10 Marks (2 out of 4 to be answered)

Other Components: **Total : 25 Marks**
Presentation of working models/Assignments/Problem solving/Seminars

STELLA MARIS COLLEGE (AUTONOMOUS), CHENAI-600 086

B.Sc. DEGREE: BRANCH III – PHYSICS

General Elective Course Offered by Department of Physics to B A./ B.Sc (Other than Mathematics, Physics, Chemistry) / B.V.A / B.Com. /B.B.A / B.C.A. / B.S.W. Degree Programme

SYLLABUS

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

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.

Unit 1 **(9 Hours)**

Introduction

1.1 Energy : Sources of Energy - Forms of Energy- Potential , Kinetic, Mechanical, Chemical and Thermal Units of Energy, Uses of Energy, Energy Conversion

1.2 Non-Renewable Energy – Coal, Petroleum, Gas , Renewable Energy- Solar, Wind, Biomass, Geothermal and Nuclear , Advantages and Disadvantages

Unit 2 **(8 Hours)**

Non-Renewable Energy

2.1 Coal - Early Uses as Fuel,-Electricity Generation, Petroleum- Composition, Reservoirs – Uses

2.2 Natural Gas – Process, Conversion to Electrical Energy

Unit 3 **(9 Hours)**

Renewable Energy

3.1 Solar Energy- Solar Energy Conversion, Solar Pond, Solar Voltaic Cell Conversion, Wind Energy , Wind Mill Types , Geothermal- Power Plants, Uses of Geothermal Water

3.2 Biomass Energy – Biofuel Conversion Process, Gasification of Bio Mass, Nuclear:

Nuclear Fission and Fusion, Power Reactors Hydroelectric Power, Principle - Production of Power

BOOKS FOR STUDY

Ashok V. Desai. *Non-conventional Energy.* New Delhi: New Age, 2001.

BOOKS FOR REFERENCE

Ashwin Paramar. *Energy Future*, New Delhi: Dominant, 2001.

Tiwari. G. N. and Ghosal M. K. *Renewable Energy resources.* New Delhi: Narosa, 2007.

Vandana. S. *Alternative Energy*. New Delhi: A P H, 2002.

PATTERN OF ASSESSMENT

No End-Semester Examination.

Continuous Assessment Test Total : 25 Marks

Section A – 5 x 3 = 15 Marks (All questions to be answered)

Section B – 2 x 5 = 10 Marks (2 out of 4 to be answered)

Other Components: Total : 25 Marks

Seminars/Quiz/Group discussion/Assignments

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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SYLLABUS
(Effective from the academic year 2019–2020**)**

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.

Unit 1 **(9 Hours)**

Radiation Propagation

1.1 Fundamentals of Electromagnetic Waves – Propagation of Waves - Ground Waves – Sky Waves – Space Waves.

1.2 Radio Broadcasting –Transmission and Reception – AM and FM.

Unit 2 **(9 Hours)**

Basics of Wireless Communication

2.1 Wireless Transmission: Introduction to Mobile Communications - Frequencies -

2.2 Signals - Signal Propagation - Cellular Systems – GSM

Unit 3 **(8 Hours)**

Mobile Communications

3.1 Modern Wireless Communication Systems : 1G, 2G, 3G and 4G network

3.2 Bluetooth – GPS – Hotspot.

BOOKS FOR STUDY

Ambrose, A., T. Vincent Devraj, *Elements of Solid State Electronics*. K.K. Dist: Meera, 1990.

Jochen Schiller, *Mobile Communications.* 2nd edition. New Delhi: Addison-Wesley, 2003.
Mehta. V.K., *Principles of Electronics.* New Delhi: S Chand, 1993.

Sarkar Subir Kumar, *Optical Fibres and Fibre Optic Communication Systems*. New Delhi: S Chand, 1997.

BOOKS FOR REFERENCE

Haykin, Simon, *Digital Communications*. New Delhi: John Wiley, 1998.
Kennedy, George, *Electronic Communication Systems.* New Delhi: Tata McGraw Hill, 1984.
Lathi B.P., *Communication System*, New Delhi: Wiley Eastern Limited, 1981.

PATTERN OF ASSESSMENT
No End-Semester Examination

Continuous Assessment Test Total : 25 Marks
Section A – 5 x 3 = 15 Marks (All questions to be answered)
Section B – 2 x 5 = 10 Marks (2 out of 4 to be answered)

Other Components: Total : 25 Marks
Seminars/Quiz/Group discussion/Assignments

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Independent Elective Course Offered by Department of Physics to
B A. / B.Sc. / B.Com. / B.C.A. / B.S.W. Degree Programmes

SYLLABUS
(Effective from the academic year 2019–2020**)**

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.

Unit 1

The Earth as a Planet

1.1 Solar System - Kepler's Law of Planetary Motion - Bode's Law

1.2 Characteristics of Planet - Origin of the Solar System - Earth's Structure

Unit 2

Gravity and the Figure of the Earth

2.1 Earth Size and Shape - Gravitation- Law of Universal Gravitation- Gravitational Acceleration - Gravitational Potential

2.2 Earth's Rotation - Earth's Figure and Gravity

Unit 3

Seismology and Seismic Waves

3.1 Elastic Theory- Elastic - an Elastic and Plastic Behavior of Materials - Elastic Waves - Body Waves - Surface Waves

3.2 Seismograph – Introduction - Various Seismometers - Seismic Wave Propagation- Introduction - Huygens's Principle – Diffraction - Fermat's Principle

Unit 4

Geomagnetism

4.1 Introduction - Discovery of Magnetism - Magnetic Properties of Material- Diamagnetic - Paramagnetic – Ferromagnetic - Curie Temperature

4.2 Magnetometers - Flux Gate Magnetometer - Proton Precession Magnetometer

Unit 5

Petroleum Geology

5.1 Introduction (Origin and Theory of Hydrocarbons) - Source Rock – Migration - Reservoir Rock - Classification of Reservoir Rocks - Physical Characteristic of Reservoir Rock (Depth, Area and Thickness, Porosity, Permeability) - Cap Rocks

5.2 Traps - Types of Traps (Structural Traps, Salt Dome Traps, Stratigraphic Traps, Combinational Traps)

BOOKS FOR STUDY

Baker Hugher *INTEQ*. *Petroleum Geology*. Mexico: Bureao of Mines, 2016.
Robert.J.Lilie. *Whole Earth Geophysics*. New Jersey: Prentice, 1999.
William Lowrie, *Fundamentals of Geophysics.* U.K: Cambridge, 1997.

BOOKS FOR REFERENCE

Don.L.Anderson. *Theory of the Earth***,** Boston: Blackwell Scientific, 1989

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

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SYLLABUS
(Effective from the academic year 2019–2020)

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.

Unit 1

Our Place in the Universe and Solar System

1.1 Introduction: Our Place in the Universe-the Sky- the Constellation- Annual Motion of the Sun-Wanderers-Time and the Calendar

1.2. The Solar System: Introduction-Asteroids-Meteoroids-Meteors-Comets-Solar Photon- Magnetosphere- Solar Flares-Maunder Minimum-Solar-Terrestrial Relations

Unit 2

Stars-Introduction

2.1 Stars: Description-Stellar Distances -Absolute Magnitude- Stellar Spectra- the Hertzsprung Russell Diagram

2.2 Stellar Sizes-Binary Stars-Eclipsing Binaries-Common Stars- Stellar-Mileposts

Unit 3

Life History of Stars

3.1 Life History of Stars: The Internal Structure of a Star

3.2 Stellar Evolution- Supernovae, Pulsars, Black Holes- Chandrasekhar's Limit and Neutron Stars

Unit 4

Our Galaxy

4.1 Our Galaxy: Star Clusters-Interstellar Matter - the Galaxy-Stellar Population- the Centre of the Galaxy

4.2 Light and Telescope : the Nature of Light – Telescopes- Detecting Light – Invisible Radiation- the Inverse Square Law

Unit 5

The Universe

5.1 The Universe-Galaxies-the Distance Scale-the Expanding Universe

5.2 Radio Galaxies- Cosmology

BOOKS FOR STUDY

Abhyankar. *Astrophysics-Stars and Galaxies*. Hyderabad: University, 2001.

BOOKS FOR REFERENCE

Baidayanath Basu. *An Introduction to Astrophysics*. New Delhi: Prentice, 1997.
Bhatia V.B. *Astronomy and Astrophysics with Elements of Cosmology***.** New Delhi: Narosa, 2001.
Kumaravelu and Susheela Kumaravelu. *Astronomy*. Nagercoil: Diocesan, 1981.
Owen Gingerrich. *New Frontiers in Astronomy*. San Fransisco: W.H.Freeman, 1970.

JOURNAL

The Astrophysical Journal - IOPscience
iopscience.iop.org/0004-637X/
International Journal of Astronomy and Astrophysics
www.scirp.org/journal/ijaa/

WEB RESOURCES

Astrophysics - NASA Science - Science@NASA
science.nasa.gov/astrophysics
Astronomy, astrophysics & cosmology - physicsworld.com

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A – 10 x 3 = 30 Marks (All questions to be answered)
Section B – 5 x 5 = 25 Marks (5 out of 7 to be answered
Section C – 3 x 15 = 45 Marks (3 out of 4 to be answered)