



## **SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE**

**(Autonomous)**

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

**Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)**

**Tamil Nadu, India**

**Website: [www.svmcugi.com](http://www.svmcugi.com) E-Mail: [principalsvmc@gmail.com](mailto:principalsvmc@gmail.com)**



## **DEGREE OF MASTER OF SCIENCE IN PHYSICS**

### **CHOICE BASED CREDIT SYSTEM (CBCS)**

## **REGULATIONS AND SYLLABUS FOR**

### **M.Sc. PHYSICS PROGRAMME**

#### **(SEMESTER PATTERN)**

**(For Students Admitted in the College from the Academic Year 2021-2022 Onwards)**



### Programme Outcomes (POs)

<b>PO1</b>	A graduate with Master degree has in depth and detailed functional knowledge of the fundamental theoretical concepts and experimental methods in respective discipline.
<b>PO2</b>	Engage in self direct continuous learning, aimed at global competency, which will promote professional and personal growth
<b>PO3</b>	Students will show that they have learnt laboratory skills, enabling them to take measurements in laboratories and analyze the measurements to draw valid conclusions.
<b>PO4</b>	Combining various academic disciplines and professional specializations to cross borders and redefine problems in order to explore solutions based on the new understanding of complex situation.
<b>PO5</b>	Acquiring knowledge at a higher level that would help to develop the necessary skills and recognize the need for the preparation and ability to engage in independent life long learning in the broadest context of technological change.

### Programme Specific Outcomes (PSOs)

<b>PSO1</b>	Apply the fundamental knowledge of Physics to appreciate, develop and test physical concepts, for applications in materials, analytical tools in medicine, engineering, technological devices, digitalized space communication etc.,
<b>PSO2</b>	Identify and access the diverse applications of Physics through the utilization of mathematical concepts to solve complex issues of environmental and safety requirements, enriching towards career advancement.
<b>PSO3</b>	Formulate the expertise in various domains of Physics acquired through the knowledge of experimental principles to demonstrate, innovate, design and develop the skills towards the futuristic needs of the industry/society.
<b>PSO4</b>	Compile research based knowledge and methods including design of experiments, analysis, interpretation and evaluation of information, to provide valid critique to the society.
<b>PSO5</b>	Communicate explicitly and exchange ideas with regard to theoretical and experimental aspects, the impacts of Physics on environment and society.
<b>PSO6</b>	Apply reasoning, informed by the contextual knowledge to access societal, health, safety, legal, ethical and cultural issues and consequent responsibilities relevant to Physics.



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Master of Science (M.Sc.) in Physics

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2021-2022 Onwards)

Sl. No.	Nature of the Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
						CIA	ESE	Total
<b>SEMESTER I</b>								
1	Core – I	21PPH1C01	Mathematical Physics	6	4	25	75	100
2	Core – II	21PPH1C02	Classical Mechanics	6	4	25	75	100
3	Core – III	21PPH1C03	Linear and Non Linear Integrated Circuits and Applications	5	4	25	75	100
4	Elective – I	21PPH1E01	Energy Physics	5	4	25	75	100
5	Core Practical– I	21PPH2P01	General and Advanced Physics Experiments	4	Credit and Marks are carried to Core Practical – I of Semester II			
6	Core Practical– II	21PPH2P02	Electronics Experiments	4	Credit and Marks are carried to Core Practical – II of Semester II			
<b>Total</b>				<b>30</b>	<b>16</b>	<b>100</b>	<b>300</b>	<b>400</b>
<b>SEMESTER II</b>								
7	Core – IV	21PPH2C04	Quantum Mechanics - I	5	4	25	75	100
8	Core – V	21PPH2C05	Thermodynamics and Statistical Physics	5	4	25	75	100
9	Core – VI	21PPH2C06	Microprocessor 8085 and Microcontroller 8051	5	4	25	75	100
10	Elective – II	21PPH2E02	Optoelectronic Devices and its Applications	5	4	25	75	100
11	Core Practical– I	21PPH2P01	General and Advanced Physics Experiments	4	4	40	60	100
12	Core Practical– II	21PPH2P02	Electronics Experiments	4	4	40	60	100
13	Common Course	21P2HR01	Human Rights	2	2	25	75	100
<b>Total</b>				<b>30</b>	<b>26</b>	<b>205</b>	<b>495</b>	<b>700</b>



Sl. No.			Extra Disciplinary Course (EDC) (Other than Physics Major students)					
1	EDC	21PPH2EDC01 /21PPH3EDC0 1	Electronic Appliances	4	4	25	75	100

**Note:**

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End Semester Examinations



# PROGRAMME SYLLABUS



Program: M.Sc. Physics				
Core – I		Course Code: 21PPH1C01		Course Title: Mathematical Physics
Semester I	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To enable the students to understand the basic principles and importance of matrix and tensor analysis, group theory and appreciate their applications in the field of Physics.
2. To provide an insight into complex analysis, special functions, transform techniques which form the back bone of all higher physics and to apply these techniques to solve Physics problems.

#### **UNIT I : VECTOR, TENSORS AND MATRIX**

Linear vector spaces, Gram - Schmidt Orthogonalization Process – Orthogonal curvilinear coordinates – Gradient, divergence, Curl and Laplacian – Evaluation of line, surface, volume integrals.

Introduction to tensors – Tensor transformation - Contravariant, Covariant tensors – Rank of a tensor – Symmetric and Anti-symmetric tensor.

Matrices – Types of matrices – Inverse of Matrix – Cayley-Hamilton's theorem - Eigen values and Eigen vectors – Diagonalization of matrices.

#### **UNIT II : INTEGRAL TRANSFORM**

**Fourier transform:** Fourier sine and cosine transform – Properties of Fourier transforms - Linear property, change of scale property, shifting property and modulation theorem - Convolution theorem – Time and frequency domain.

**Laplace Transform:** Laplace formulae – Properties of Laplace transforms (Linear property – Change of scale property, first and second shifting theorems) – Inverse Laplace Transforms .

#### **UNIT III : COMPLEX ANALYSIS**

Complex function – Analytic function – Limit, Continuity – Differentiability – Cauchy-Riemann conditions-Cauchy's integral theorem - Simply and multiply connected regions – Cauchy's integral formula -Taylor and Laurent expansion – Residues – Cauchy's residue theorem –Evaluation of definite integrals – Contour integration.

**UNIT IV : SPECIAL FUNCTIONS**

Bessel, Legendre, Laguerre and Hermite differential equations - Generating functions-orthogonality properties - Recurrence relations - Rodrigue's formula - Polynomials.

**UNIT V : GROUP THEORY**

**Groups and their basic Properties:** Group – Basic properties – Abelian group – Isomorphic group – Similarity transformation and classes – Group multiplication tables

**Representation of Groups:** Symmetric elements – Transformation, Matrix representation – Point groups – Reducible and irreducible representations – Great orthogonality theorem – Construction of character tables for point groups  $C_{2v}$  -  $XY_2$  bent symmetrical type molecule - and  $C_{3v}$  -  $XY_3$  Pyramidal type molecule- Structure of character tables.

**BOOKS FOR STUDY:**

1. Satya Prakash, Mathematical Physics, Sultan Chand & Sons, New Delhi (2004).  
[Unit Covered: 1 – 5: Pages: 2 - 117, 231 - 301, 514 – 606, 820 - 881, 998 - 1034].
2. B.D. Gupta, Mathematical Physics, Vikas publishing house, New Delhi (2010).  
[Unit Covered: 1 – 5: Sections: 1.1 – 1.188, 3.1 – 3.86, 4.1 – 4.86, 5.1 – 5.155, 9.1 – 9.64, 10.1 – 10.62].

**BOOKS FOR REFERENCE:**

1. A.W. Joshi, Matrices and Tensors in Physics, New Age, New Delhi (2006).
2. G. Arfken and H.J. Weber, Mathematical methods for Physicists, Academic Press (1995).
3. K.F. Riley, M.P. Hobson and S.J. Bence, Mathematical Methods for Physics and Engineering, Cambridge University Press (1998).
4. R.V. Churchill, Complex variables and applications, McGraw Hill (1990).
5. W. Bell, Special functions for Scientists and Engineers, Dover Publications, Inc., Mineola, New York (2004).
6. A.W. Joshi Elements of Group Theory for Physicists, Wiley Eastern (1997).

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO1	Use the complex derivatives function, use and operate analytic functions, demonstrate knowledge of integration in the complex plane, use the Cauchy integral theorem and formula, understand residues and their use in integration.	K1 & K2
CO2	Gain a working knowledge of know elementary ideas in Gamma and Beta functions, series solutions and special functions, will be able to apply to solve problems in classical, statistical and quantum mechanics as well as electromagnetism	K2
CO3	Evaluate the Fourier transform of a continuous function, and be familiar with its basic properties and convolution theorem and also learn Laplace transform, properties and special functions will help the students to critically analyze physical problems.	K2 & K3
CO4	Understand Tensors and its importance in physics because they provide a concise mathematical framework for formulating and solving physics problems in areas such as elasticity, fluid mechanics, and general relativity.	K4
CO5	The basic ideas of Group Theory and the closely related representation theory have many important applications in physics, chemistry, and materials science.	K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6–Create**

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong,

M – Medium,

L – Low





Program: M.Sc. Physics				
Core – II		Course Code: 21PPH1C02		Course Title: Classical Mechanics
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	6	90	4	100

### COURSE OBJECTIVES

1. To acquire basic concept and knowledge relevant to methods of Lagrangian and Hamiltonian Dynamics.
2. To apply the Lagrangian Dynamics method for the study of small oscillations and motion of rigid bodies.
3. To solve problems pertaining to physical bodies using Canonical transformation and Hamilton Jacobi method.

### **UNIT I: LAGRANGIAN FORMULATION, APPLICATIONS AND HAMILTON PRINCIPLE**

Mechanics of a system of particles: Constraints and its classifications – Generalized coordinates – Degrees of freedom – Principle of Virtual work - D'Alembert's principle – Cyclic coordinates - Lagrange's Equations – Applications of Lagrange's formulation – Compound pendulum – Simple pendulum – Particle moving on the surface of the earth – Bead sliding on a uniformly rotating wire in a force free space – Calculus of variations: Hamilton's principle – Lagrange's equation from Hamilton's principle.

### **UNIT II: HAMILTONIAN FORMULATION-APPLICATIONS**

Hamiltonian of a system – Generalised Momentum and Cyclic coordinates – Integrals of Hamilton's equations – Hamilton's canonical equations of motion, significance – Deduction of canonical equations from a variational principle – Harmonic Oscillator – Particle moving near the surface of the earth – Particle in a central field of force – Hamiltonian for a charged particle in an electromagnetic field – Principle of least action.



### **UNIT III: CANONICAL TRANSFORMATION AND HAMILTON-JACOBI THEORY**

Canonical transformation – Advantage – Examples of Canonical transformations – Condition for a transformation to be Canonical – Infinitesimal Canonical transformation – Hamilton–Jacobi method – Hamilton–Jacobi partial differential equation – Hamilton–Jacobi equation for principal function, and characteristic function – Harmonic oscillator problem by Hamilton – Jacobi method – Kepler's problem solution by Hamilton–Jacobi method.

### **UNIT IV: ACTION ANGLE VARIABLE, POISSON BRACKET-LAGRANGE'S BRACKET**

Action angle variables – Harmonic oscillator in action-angle variables – Poisson brackets – Properties of Poisson bracket – Invariance of Poisson brackets to Canonical transformations – Equation of motion in Poisson bracket form – Infinitesimal contact transformations – Angular momentum and Poisson bracket - Lagrange brackets – Properties of Lagrange brackets - Invariant of Lagrange bracket under Canonical transformation – Relation between Lagrange and Poisson brackets.

### **UNIT V: MECHANICS OF SMALL OSCILLATIONS, RIGID BODY'S KINEMATICS**

Lagrangian equations of motion for small oscillations – Normal coordinates and normal frequencies of vibration – Vibrations of a linear triatomic molecule – Euler's angles rotating coordinate system – Coriolis force – Angular momentum – Kinetic energy of a rigid body – Moments and products of inertia – Euler equations of motion – Torque free motion of rigid body – Motion of symmetrical top under the action of gravity.

#### **BOOKS FOR STUDY:**

1. S. L. Gupta, V. Kumar, H.V. Sharma, Classical Mechanics, Pragati Prakashan Educational Publishers, Meerut (2007).  
[Unit Covered: 1–5: Pages : 6–19, 25–40, 50–65, 100–115, 340–343, 125–140, 150–185, 245–290, 325–348].
2. G. Aruldas, Classical Mechanics, Prentice - Hall of India Pvt. Ltd., New Delhi (2008).  
[Unit Covered: 1–5: Pages: 1–20, 39–50, 60–85, 78–96, 137–167, 173–189, 196–219, 231–251].

**BOOKS FOR REFERENCE**

1. K.C. Gupta, Classical Mechanics of Particles and Rigid Bodies, New Age International, New Delhi (1997).
2. J.C. Upadhaya, Classical Mechanics, Himalaya Publishing House Pvt. Ltd., Bangalore Second Edition (2017).
3. H. Goldstein, C. Poole and J. Safko, Classical Mechanics, Pearson Education Asia, New Delhi (2002).
4. S.N. Biswas, Classical Mechanics, Books and Allied Ltd., Kolkata (1998).
5. N.C. Rana and P.S. Joag, Classical Mechanics, Tata McGraw Hill Publishing Company Ltd., New Delhi (1991).
6. R.G. Takwa, Introduction to Classical Mechanics, Himalaya Publishing House Pvt. Ltd., Bangalore (2010).

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO 1	Formulate and solve classical mechanics problems using Lagrangian and Hamiltonian methods.	K1 & K2
CO 2	Find constants of motion according to the Hamilton Jacobi theory using Canonical transformations.	K3 & K4
CO 3	Study periodic motion by action-angle variables and find derivatives in phase space using Poisson brackets.	K3 & K4
CO 4	Apply methods of classical mechanics, including normal modes, to a continuum system such as a fluid.	K5 & K6
CO 5	Use symmetries of a system to identify conserved quantities and predict the nature of normal modes of its linearization.	K5 & K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create**

**Mapping of COs with POs**

<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	M	M	M	M	S
<b>CO2</b>	M	M	M	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	S	S	S

**S – Strong,****M – Medium,****L – Low**



Program: M.Sc. Physics				
Core – III		Course Code: 21PPH1C03		Course Title: Linear And Non-Linear Integrated Circuits And Applications
Semester I	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To acquire knowledge about operational amplifiers and waveform generators.
2. To understand the theories of combinational and sequential logic circuits.
3. To habituate the concepts of data converter and active filters.

#### **UNIT I: OPERATIONAL AMPLIFIER AND ANALOG COMPUTATION**

Operational Amplifier –Definition and Block diagram of Operational Amplifier - Electrical Parameters – Offset and Null Connection – Offset Error and Correction - Inverting Single Input Summing Amplifier – Three Input Averaging Amplifier - Differential Amplifier - General Linear Applications – Voltage to Current Converter – Current to Voltage Converter- Simultaneous equations and differential equations- Instrumentation amplifier- Log and Antilog amplifiers- Analog multiplication and division – Internal circuitry of operational amplifier (Only for Study).

#### **UNIT II: LINEAR IC'S - WAVEFORM GENERATORS**

Sine wave Oscillator - Wien's Bridge Oscillator and Phase shift oscillator – Square wave generator – Triangular wave generator - Saw-tooth generator – Quadrature Oscillator - Pulse generator — 555 Timer IC - Internal Architecture and working – Astable multi vibrator - Voltage controlled oscillator - Monostable multi vibrator - Schmidt trigger – Squarer - Phase Locked Loop (PLL) - Application of PLL in Television Transmission.

#### **UNIT III: COMBINATIONAL LOGIC CIRCUITS**

NAND/ NOR as Universal building blocks – Half and Full Adders - Half and Full Subtractors – 4 bit binary Adder and Subtractor - 4 bit BCD Adder and Subtractor - Encoder and Decoder- Multiplexer and Demultiplexer - Memory Devices – ROM – RAM – EPROM.

**UNIT IV: SEQUENTIAL LOGIC CIRCUITS**

Flip Flops- RS Flip flop, Clocked RS Flip flop, D-type Flip flop, JK Flip flop, T Flip flop and M/S JK Flip flop, Counters- Synchronous, Asynchronous (Up and Down) and Modulus counters- BCD counters- Shift registers- Ring counter as divide by N counter- Johnson counter - Applications.

**UNIT V: DATA CONVERTERS AND ACTIVE FILTERS**

Digital to analog converter - Binary weighted and R/2R ladder type- Accuracy and resolution - Dual slope digital to analog converter – Analog to digital converter - Simultaneous conversion - Counter method - Successive approximation method.

Active filters – Low pass, High Pass, Band pass, Band stop - Second order Butter worth design – Multiple Feedback filter circuit.

**BOOKS FOR STUDY:**

1. Ramakant A Gayakwad, Op-Amps and Linear Integrated Circuits, Fourth Edition, Pearson, Prentice Hall (2000).
2. Anil K Maini, Digital Electronics, Principles, Devices and Applications, John Wiley and Sons Limited (2007).
3. Donald P Leach & Albert Paul Malvino, Digital Principles and Applications, Seventh Edition, Tata McGraw Hill Education Private Limited, New Delhi (2011).

**BOOKS FOR REFERENCE:**

1. Jacob Millman, Christes C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Second Edition, Mc-Graw Hill, Kogakusha, Japan (2011).
2. Thomas L. Floyd, David Buchla, Basic Operational Amplifiers and Linear Integrated Circuits, Second Edition, Prentice Hall (1999).



### COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire elaborate knowledge about operational amplifier and its applications	K1 & K2
CO2	Understand the concepts of oscillators & multivibrators and its applications in electronic devives.	K2 & K3
CO3	Gain the knowledge of basic digital circuits and memory devices.	K3 & K4
CO4	Develope the practical knowdege in the field of registers and counters.	K5 & K6
CO5	Understand the working principles of data converting circuits and active filters.	K5

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 – Create**

### Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong,

M – Medium,

L – Low



Program: M.Sc. Physics				
Elective – I		Course Code: 21PPH1E01		Course Title: Energy Physics
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	5	75	4	100

### COURSE OBJECTIVES

1. To gain knowledge relevant to Physics aspects of different energy sources.
2. To understand technological aspects of renewable energy devices and their application potentials.

#### **UNIT - I: ENERGY SOURCES**

Energy sources–Renewable energy sources and their types – Non-renewable energy sources and their types –Advantages and disadvantages–Solar radiation: Extra-terrestrial and terrestrial radiation – World energy futures.

#### **UNIT -II: SOLAR CELLS**

Solar photovoltaics – Principle of photovoltaic conversion of solar energy– Solar cell parameters, Solar cell electrical characteristics – Efficiency of solar cell – Types of solar cells and their fabrication: Silicon, Thin-film and Dye-sensitized solar cells – Applications of solar cells.

#### **UNIT -III: APPLICATIONS OF SOLAR ENERGY**

Solar water heating – Solar space heating–Solar space cooling– Solar dryer –Solar distillation – Solar pumping – Solar furnace – Solar cooker – Solar greenhouse– Solar photocatalysis.

#### **UNIT -IV: WIND ENERGY**

Basic principles and components of wind energy conversion systems - Wind data and energy estimation –Types: Vertical axis and horizontal axis wind machines – Scheme for electric generation – Safety system – Environmental aspects - Applications of wind energy.





### UNIT -V: ENERGY FROM BIOMASS

Biomass conversion technologies – Wet and dry process – Photosynthesis –Biogas generation: Basic processes and energetics – Factors affecting biodigestion and generation of gas – Classification of biogas plants: Continuous and batch types, dome and drum types – Properties of biogas –Applications of biogas.

#### BOOKS FOR STUDY:

1. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, New Delhi (2009).

[Unit Covered: 1–5: Pages: 1–72, 146–223, 227–310, 311–384]

#### BOOKS FOR REFERENCE:

1. F. Kreith and J.F. Kreider, Principles of Solar Engineering, Tata McGraw Hill (1978).

2. A.B. Meinel and A.P.Meinel, Applied Solar Energy, Addison Wesley Publishing Co. (1976).

3. M.P.Agarwal, Solar Energy, S. Chand and Co., New Delhi (1983).

4. S.P.Sukhatme, Solar Energy, Tata McGraw Hill (1997).

### COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about origin and types of diverse energy sources	K1 & K2
CO2	Understand properties of energy sources and identify their application potentials	K2 & K3
CO3	Gather research-based knowledge about principal, construction and operation of different energy conversion technologies	K3&K4
CO4	Acquire information pertaining to application potential of various energy sources through appropriate technologies	K5
CO5	Develop skills to design portable energy conversion devices and their demonstration	K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	M	S	S	S
CO3	S	S	S	S	S
CO4	M	S	S	S	S
CO5	S	S	S	S	S

**S – Strong,****M – Medium,****L – Low**



Program: M.Sc. Physics				
Core Practical – I		Course Code: 21PPH2P01		Course Title: General and Advanced Physics Experiments
Semester I and II	Hours/Week 4	Total Hours 120	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To understand the concept of mechanical behavior of materials and calculation of same using appropriate equations.
2. To calculate the thermodynamic quantities and physical properties of materials.
3. To analyze the optical and electrical properties of materials.

### SEMESTER – I

#### I(a). GENERAL PHYSICS EXPERIMENTS

(Any *ten* Experiments)

1. Determination of Young's Modulus and Poisson's ratio by Elliptic fringes - Cornu's Method
2. Determination of Young's modulus and Poisson's ratio by Hyperbolic fringes - Cornu's Method
3. Determination of Viscosity of the given liquid – Meyer's disc.
4. Determination of Stefan's constant of radiation from a hot body.
5. Measurement of Coefficient of linear expansion- Air wedge Method
6. Determination of Permittivity of a liquid using an RFO
7. Measurement of Susceptibility of liquid - Quincke's method.
8. B-H loop using Anchor ring.
9. B-H curve using CRO.
10. Measurement of Magnetic Susceptibility - Guoy's method.
11. Determination of Thickness of the enamel coating on a wire by diffraction
12. Determination of Rydberg's Constant - Hydrogen Spectrum
13. FP Etalon
14. LG Plate.



15. Arc spectrum: Copper
16. Determination of Solar constant.
17. Determination of Thickness of air film. - Solar spectrum – Hartmann's formula. Edser and Butler fringes
18. Measurement of Band gap energy- Thermistor
19. Determination of Planck Constant – LED Method

## SEMESTER – II

### I (b). ADVANCED PHYSICS EXPERIMENTS

(Any *twelve* Experiments)

1. Determination of Specific charge of an electron – Thomson's method.
2. Determination of  $e/m$  - Millikan's method.
3. Determination of Compressibility of a liquid using Ultrasonics .
4. Miscibility measurements using ultrasonic diffraction method.
5. Determination of Wavelength, Separation of wavelengths - Michelson Interferometer
6. Determination of Thickness of thin film. - Michelson Interferometer
7. GM counter – Characteristics, inverse square law and absorption coefficient.
8. GM counter – Feather's analysis: Range of Beta rays.
9. Measurement of Conductivity - Four probe method.
10. Arc spectrum – Iron.
11. Iodine absorption spectra.
12. Molecular spectra – AIO band.
13. Molecular spectra – CN bands.
14. Measurement of wavelength of Diode Laser / He – Ne Laser using Diffraction grating.
15. Determination of Diffraction pattern of light with circular aperture using Diode/He-Ne laser.
16. Study the beam divergence, spot size and intensity profile of Diode/He-Ne laser.
17. Determination of Refractive index of liquids using diode Laser/ He – Ne Laser.
18. Determination of Numerical Aperture and Acceptance angle of optical fibres using Laser Source.



19. Measurements of Standing wave and standing wave co-efficient, Law of Inverse square, Receiver end transmitter behavior, Radiation Pattern - Microwave test bench
20. Measurement of Dielectricity - Microwave test bench.
21. Hall Effect in Semiconductor. Determine the Hall coefficient, carrier concentration and carrier mobility.
22. UV-Visible spectroscopy – Verification of Beer-Lambert's law and identification of wavelength maxima – Extinction coefficient
23. Interpretation of vibrational spectra of a given material.
24. Determination of I – V Characteristics and efficiency of solar cell.

**BOOKS FOR REFERENCE:**

1. Advanced Practical Physics, S.P Singh, PragatiPrakasan.
2. Practical Physics, Gupta and Kumar, PragatiPrakasan.
3. Kit Developed for doing experiments in Physics- Instruction manual, R.Srinivasan K.R Priolkar, Indian Academy of Sciences.
4. An advanced course in Practical Physics, D.Chattopadhyay, C.R Rakshit, New Central Book Agency Pvt. Ltd:
5. A course on experiment with He-Ne Laser, R.SSirohi, John Wiley & Sons (Asia) Pvt.ltd

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the strength of material using Young's modulus.	K1 & K2
CO2	Acquire knowledge of thermal behaviour of the materials.	K2 & K3
CO3	Understand theoretical principles of magnetism through the experiments.	K4
CO4	Acquire knowledge about arc spectrum and applications of laser	K5 & K6
CO5	Improve the analytical and observation ability in Physics Experiments	K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create**

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	S	S	S
CO3	S	S	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

**S – Strong, M – Medium, L – Low**



Program: M.Sc. Physics				
Core Practical – II		Course Code: 21PPH2P02		Course Title: Electronics Experiments
Semester I and II	Hours/Week 4	Total Hours 120	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To observe the applications of FET and UJT.
2. To study the different applications of operational amplifier circuits.
3. To learn about Combinational Logic Circuits and Sequential Logic Circuits

### SEMESTER – I

#### II(a). ELECTRONICS EXPERIMENTS

(Any *twelve* Experiments)

1. Construction of relaxation oscillator using UJT
2. FET CS amplifier- Frequency response, input impedance, output impedance
3. Study of important electrical characteristics of IC741.
4. V- I Characteristics of different colours of LED.
5. Study of attenuation characteristics of Wien's bridge network and design of Wien's bridge oscillator using Op-Amp.
6. Study of attenuation characteristics of Phase shift network and design of Phase shift oscillator using Op-Amp.
7. Construction of Schmidt trigger circuit using IC 741 for a given hysteresis-application as squarer.
8. Construction of square wave oscillator using IC 741- Triangular wave oscillator using IC 741- Triangular wave generator
9. Construction of a quadrature wave using IC 324
10. Construction of pulse generator using the IC 741 – application as frequency divider
11. Construction of Op-Amp- 4 bit Digital to Analog converter (Binary Weighted and R/2R ladder type)
12. Study of Binary to Gray and Gray to Binary code conversion.
13. Study of R-S, clocked R-S and D-Flip flop using NAND gates



14. Study of J-K, D and T flip flops using IC 7476/7473
15. Arithmetic operations using IC 7483- 4 bit binary addition and subtraction.
16. Study of Arithmetic logic unit using IC 74181
17. Construction of Encoder and Decoder circuits using ICs.

## SEMESTER – II

### II(b). ELECTRONICS EXPERIMENTS

#### (Any twelve Experiments)

1. IC 7490 as scalar and seven segment display using IC7447
2. Solving simultaneous equations – IC 741 / IC LM324.
3. Op-Amp –Active filters : Low pass, High pass and Band pass filters (Second Order) Butter worth filter.
4. Construction of Current to Voltage and Voltage to Current Conversion using IC 741.
5. Construction of second order butterworth multiple feedback narrow band pass filter
6. Realization of analog to digital converter (ADC) using 4-bit DAC and synchronous counter IC74193
7. Construction of square wave generator using IC 555 – Study of VCO.
8. Construction of Schmidt trigger circuit using IC555 for a given hysteresis – Application as squarer.
9. Construction of pulse generator using the IC 555 – Application as frequency divider.
10. BCD to Excess- 3 and Excess 3 to BCD code conversion.
11. Study of binary up / down counters - IC 7476 / IC7473
12. Shift register and Ring counter and Johnson counter- IC 7476/IC 7474
13. Study of synchronous parallel 4-bit binary up/down counter using IC 74193
14. Study of asynchronous parallel 4-bit binary up/down counter using IC 7493
15. Study of Modulus Counter.
16. Construction of Multiplexer and Demultiplexer using ICs.

#### BOOKS FOR REFERENCE:

1. Op-Amp and linear integrated circuit, Ramakanth A Gaykwad, Eastern Economy Edition.
2. Electronic Laboratory Primer a design approach, S. Poornachandra, B.Sasikala, Wheeler Publishing, New Delhi.
3. Electronic lab manual Vol I, K ANavas, Rajath Publishing.





4. Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition
5. Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing.
6. An advanced course in Practical Physics, D.Chattopadhyay, C.R Rakshit, New Central Book Agency Pvt. Ltd.

### COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Conduct experiments on applications of FET and UJT	K1 & K2
CO2	Analyze various parameters related to operational amplifiers.	K2 & K3
CO3	Understand the concepts involved in arithmetic and logical circuits using IC's	K4
CO4	Acquire knowledge about Combinational Logic Circuits and Sequential Logic Circuits	K5
CO5	Analyze the applications of counters and registers	K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create

### Mapping of COs with Pos

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong,

M – Medium,

L – Low



Program: M.Sc. Physics				
Core – IV		Course Code: 21PPH2C04		Course Title: Quantum Mechanics - I
Semester II	Hours/Week	Total Hours	Credits	Total Marks
	5	75	4	100

### COURSE OBJECTIVES

1. To familiarize basic concepts of Quantum Mechanics and its features.
2. To understand procedures involved in perturbation process and its applications.
3. To acquire knowledge about angular momentum and representation of matrix.

#### **UNIT –I: FORMALISM OF QUANTUM MECHANICS**

Physical Interpretation of Wave Functions Expectation Values of Dynamical Quantities – Probability Current Density - Ehrenfest Theorem, Schrodinger Equation in Momentum Representation - Momentum Operator – Hamiltonian Operator – Hermitian Operator and its Properties, Dirac Delta Function – Completeness Property of Eigen Functions Superposition of Eigen States – Parity Operator, Commutator Algebra –Schwarz Inequality, Heisenberg's Uncertainty Relation Derived from Operators and its Applications.

#### **UNIT -II: MATRIX REPRESENTATION**

Hilbert Space – Unitary Transformation and their Properties, Representation of State Vector and Equation of Motion: Schrodinger Picture – Heisenberg Picture – The Interaction Picture, Dirac's BRA and KET Vector Notation, Coordinate and Momentum Representation, Matrix Theory of Harmonic Oscillator.

#### **UNIT –III: ANGULAR MOMENTUM**

Angular Momentum in Position Representation, Spin Angular Momentum – Total Angular Momentum, Commutation Relations for Angular Momentum Operators, Eigen Value Spectrum  $J^2$  and  $J_z$ ,  $J_x$  and  $J_y$ , Raising and Lowering Operators:  $J_+$  and  $J_-$ , Addition of Angular Momenta – Clebsch-Gordon Co-efficient –its Properties and its Evaluation.

#### **UNIT –IV: PERTURBATION THEORY FOR STATIONARY STATES**



First and Second Order Perturbation Theory in Non– Degenerate and Degenerate Cases - Stark Effect in Hydrogen Atom, Variation Method – Application to Ground State of Helium Atom, Application to Ground State of Hydrogen Atom, WKB Approximation – Probability of Penetration of Barrier.

#### **UNIT – V: TIME DEPENDENT APPROXIMATION METHODS**

Time Dependent Perturbation Theory, Fermi Golden Rule, Constant and Harmonic Perturbations, Adiabatic and Sudden Approximation, A Charged Particle in an Electromagnetic Field.

#### **BOOKS FOR STUDY:**

1. Satya Prakash, Quantum Mechanics, Kedar Nath Ram Nath, Meerut (2009).  
[Units Covered: 1– 5: Pages: 90-93, 95, 96, 113, 114, 240 – 249, 252, 253, 256, 257, 260 – 265, 270 – 274, 276, 277, 328 – 330, 334 – 338, 339 – 349, 351 – 355, 396, 397, 400 – 407, 415 – 419, 441- 456, 469 – 478, 489 – 493, 497 – 500, 518 – 532]
2. G. Aruldhas, Quantum Mechanics, Prentice- Hall of India, New Delhi (2006).  
[Units Covered: 1– 5: Pages: 24, 33 – 38, 49 – 52, 54 – 56, 63 – 68, 148 – 150, 170 – 184, 195 – 204, 215, 216, 218 – 222, 229 -231, 242 – 246]

#### **BOOKS FOR REFERENCES:**

1. R.K. Srivastava, Quantum Mechanics, Prentice- Hall of India, New Delhi (2007)
2. P. M. Mathews and K. Venkatesan , A Text Book of Quantum Mechanics, Tata McGraw Hill, New Delhi (1987)
3. Pauling and E.B.Wilson, Quantum Mechanics, McGraw Hill, New York (1935).
4. Leonard I. Schiff, Quantum Mechanics, McGraw, Hill (1968).
5. E. Merzbacher, Quantum Mechanics, Third Edition, John Wiley and Sons (2004).
6. David J.Griffiths, Introduction to Quantum Mechanics, Second Edition, Addison Wesley (1999).

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO1	Understand fundamental, principles of quantum mechanics	K1 & K2
CO2	Understands about different perturbation and variation methods	K2 & K3
CO3	Gather knowledge about time dependent and independent theories.	K3&K4
CO4	Gain knowledge regarding methods of determining lower level of Hydrogen and Helium atom.	K5
CO5	Learn about the Angular momentum and its rules.	K3, K4 &K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create**

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong,**

**M – Medium,**

**L – Low**



Program: M.Sc. Physics				
Core – V		Course Code: 21PPH2C05		Course Title: Thermodynamics and Statistical Physics
Semester II	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To understanding laws of thermodynamics and a systematic definition of thermodynamic potentials as the general formalism of thermodynamics.
2. To overview foundations of equilibrium statistical physics as the microscopic theory of matter and fields.

#### **UNIT I: THERMODYNAMICS AND APPLICATIONS**

Laws of Thermodynamics - Entropy and probability – Change in entropy of a solid/Liquid – Thermodynamic potentials and the reciprocity relations – Thermodynamic equilibria – Nernst's heat theorem – Blackbody radiation and Planck's radiation distribution law – Experimental Verification of Planck's radiation Law.

#### **UNIT II: SPECIFIC HEAT OF SOLIDS**

Specific heat of solids: Dulong and Petit's law – Variation Specific heat and atomic heat with temperature – Einstein's theory of the specific heat of solid – Debye's theory of specific heat capacity of solids – Criticism of Debye theory – Negative temperature – Liquid helium I and II – Bose-Einstein condensation - Superfluidity

#### **UNIT III: ENSEMBLES AND PARTITION FUNCTION**

Ensembles: Microcanonical ensemble, Canonical ensemble and Grand canonical ensemble – Comparison of various ensembles – Partition function and its correlation with thermodynamic quantities – Helmholtz free energy – Entropy of a system – Probability of one-dimensional random walk – Brownian movement.

#### **UNIT IV: CLASSICAL STATISTICS**

Phase space – Microstate and macrostate of a system – Application – Harmonic Oscillator – A free Particle - Liouville's Theorem – Entropy of a perfect gas: Gibbs' paradox – Removal of



paradox – Perfect gas in Micro Canonical ensemble – Ideal gas in Canonical ensembles – Ideal gas in Grand Canonical ensembles.

### UNIT V: QUANTUM STATISTICS

Stirling's approximation – Thermodynamical probability – Maxwell Boltzmann statistics – Bose-Einstein quantum statistics – Fermi Dirac statistics – Comparison of three distribution statistics – Thermionic emission – Van der Waals gas equation – Phase transition: Second order phase transition – Ising model in one dimension.

#### BOOKS FOR STUDY:

1. Gupta and Kumar, Elementary Statistical Mechanics, Pragati Prakashan, Meerut (2011).  
[Unit Covered: 1–5: Pages: 10–28, 33–40, 72–80, 100–156, 210–227, 235–241, 250–265, 310–326].
2. Sathya Prakash, Statistical Mechanics, Pragati Prakashan, Meerut (2004).  
[Unit Covered: 1–5: Pages: 10–34, 65–80, 100–105, 118–120, 191–197, 225–238, 245–252, 272–275, 288–335, 370–415, 435–445, 536–540, 558–570]
3. B. K. Agarwal and M. Eisner, Statistical Mechanics, New Age International, New Delhi (1998).  
[Unit covered: 1–5: Pages: 2–13, 18–25, 45–55, 61–80, 119–125, 147–158, 204–210, 215–225, 259–263].

#### BOOKS FOR REFERENCE:

1. K. Huang, Statistical Mechanics, John Wiley and Sons, New Delhi (1975).
2. R.K. Pathria and Paul D Beale, Statistical Mechanics, Academic Press (2000).
3. F. Reif, Statistical and Thermal Physics, McGraw Hill, International Edition, Singapore (1975).
4. B.B. Laud, Fundamentals of Statistical Mechanics - New Age International Publishers, Second Edition (2012).
5. C. Kittel, Elementary Statistical Physics, John Wiley & Sons, (2004).
6. R.P. Feynman, Statistical Mechanics, Addison Wesley, First Edition, (1998).
7. R.K. Pathria, Statistical Physics, Pergamon, Oxford, Third Edition, (2011).
8. S.R.A. Salinas, Introductory Statistical Physics, Springer (2000).

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO 1	Understand laws and concepts of thermodynamics	K1 & K2
CO2	Apply statistical physics methods to solve problems in physical systems.	K2 & K3
CO 3	Apply concepts and principles of black body radiations and thermodynamics to analyze radiation phenomena in thermodynamic systems.	K3 & K4
CO 4	Analyze phase equilibrium condition and identify types of phase transitions of physical systems.	K3 & K4
CO 5	Understand phase space, micro and macro states; Quantum statistical mechanics and Distribution laws.	K5 & K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create**

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	M	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong,**

**M – Medium,**

**L – Low**



Program: M.Sc. Physics				
Core – VI		Course Code: 21PPH2C06		Course Title: Microprocessor 8085 and Microcontroller 8051
Semester II	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To provide an understanding of the architecture and functioning of microprocessor 8085A and to the methods of interfacing I/O devices and memory to microprocessor.
2. To introduce 8085A programming and applications and the architecture and instruction sets of microcontroller 8051.

#### **UNIT I: 8085 PROGRAMMING, PERIPHERAL DEVICES AND THEIR INTERFACING**

Instruction set - Addressing modes - Programming techniques - Memory mapped I/O scheme- I/O mapped I/O scheme - Memory and I/O interfacing- Data transfer schemes - Interrupts of 8085 - Programmable peripheral interface (PPI) - Control group and control word- Programmable DMA controller - Programmable interrupt controller – Programmable communication interface - Programmable counter /interval timer.

#### **UNIT II: 8085 INTERFACING APPLICATIONS**

Seven segment display interface - Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities –(Voltage and current) Measurement of physical quantities(Temperature and strain).

#### **UNIT III: 8051 MICROCONTROLLER HARDWARE**

Introduction – Features of 8051 – 8051 Microcontroller Hardware : Pin-out 8051, Central Processing Unit (CPU), internal RAM, Internal ROM, Register set of 8051 – Memory organization of 8051 – Input/Output pins, Ports and Circuits – External data memory and program memory : External program memory, External data memory.





## **UNIT IV: 8051 INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING**

Addressing modes – Data moving (Data transfer) instructions : Instructions to Access external data memory, external ROM / program memory, PUSH and POP instructions, Data exchange instructions – Logical instructions : byte and bit level logical operations, Rotate and swap operations – Arithmetic instructions : Flags, Incrementing and decrementing, Addition, Subtraction, Multiplication and division, Decimal arithmetic – Jump and CALL instructions : Jump and Call program range, Jump, Call and subroutines – Programming.

## **UNIT V: INTERRUPT PROGRAMMING AND INTERFACING TO EXTERNAL WORLD**

8051 Interrupts – Interrupt vector table – Enabling and disabling an interrupt – Timer interrupts and programming – Programming external hardware interrupts – Serial communication interrupts and programming – Interrupt priority in the 8051 : Nested interrupts , Software triggering of interrupt.

LED Interface Seven segment display interface- Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities –Voltage and current) Measurement of physical quantities(Temperature an strain).

### **BOOKS FOR STUDY:**

1. A. Nagoor Kani, Microprocessors & Microcontrollers, RBA Publications (2009).  
[Unit Covered: 1 – 5: Pages: 1 - 42,53 - 87, 97 – 159, 299 - 328, 333 - 397].
2. A. P. Godse and D. A. Godse, Microprocessors, Technical Publications, Pune (2009).  
[Unit Covered: 1: Pages: 1 - 84].
3. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publishing (2013).  
[Unit Covered: 1 - 5] [Pages: 1 - 25,54 - 85, 446 – 477, 497 - 501].
4. B. Ram, Fundamentals of Microprocessors & Microcontrollers, Dhanpat Rai publications New Delhi (2016).

### **BOOKS FOR REFERENCE:**

1. Douglas V. Hall, Microprocessors and Interfacing programming and Hardware, Tata Mc Graw Hill Publications (2008)
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education (2008).



### COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge of architecture and working of 8085 microprocessor.	K1 & K2
CO2	Get knowledge of architecture and working of 8051 Microcontroller.	K3
CO3	Be able to write simple assembly language programs for 8085A microprocessor.	K3 & K4
CO4	Able to write simple assembly language programs for 8051 Microcontroller.	K5
CO5	Understand the different applications of microprocessor and microcontroller.	K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6–Create

### Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong,

M – Medium,

L – Low



Program: M.Sc. Physics				
Elective – II		Course Code: 21PPH2E02		Course Title: Optoelectronic Devices and its Applications
Semester II	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To acquire basic principle and knowledge about optoelectronics and optical fiber communication systems.
2. To understand technological aspects of diverse optoelectronic devices and their applications.

#### **UNIT – I: PHYSICS OF LIGHT AND FIBER OPTICS**

Propagation of electromagnetic waves in dielectric wave guides– Wave nature of light, basic optical laws and definition - Introduction to optical fibers-Principles of light propagation through optical fiber- Structure and properties of optical fiber. Types of fibers: Single mode and multimode fibers – Step index and graded index fibers.

#### **UNIT – II: OPTICAL SOURCES**

LED Structures–efficiency –Lasers–Principles of lasers: Absorption of radiation, spontaneous and stimulated emission –Three level and four level lasers– He-Ne laser– Ruby laser – Diode laser: Homojunction and heterojunction diode lasers.

#### **UNIT - III: OPTICAL MODULATORS AND DETECTORS:**

Introduction – Analog and Digital Modulator– Electro-optic modulators– Acousto and electro-optic modulators– Modulation types: Amplitude, frequency and pulse code modulation– Detection and demodulation– Detection and demodulation– PIN– Avalanche photodetector– Photomultiplier tube.

#### **UNIT - IV:FIBER OPTIC SENSORS**

Introduction –Types: Intrinsic and extrinsic sensors– Intensity modulated sensors–Fiber based sensors for displacement, temperature and pressure measurements– Fiber Bragg grating based sensors.



## UNIT – V: INTERFEROMETRIC FIBER OPTIC SENSORS

Basic principles– Interferometric Sensors: Mach-Zehnder, Michelson and Fabry-Perot interferometers – Sagnac interferometer– Fiber-optic gyroscope– Applications of interferometric fiber optic sensors.

### BOOKS FOR STUDY:

1. Dr. M. Arumugam, Optical Fiber Communication and Sensors, Anuradha Agencies Publishers, Kumbakonam (2002).

[Unit Covered: 1–5 : Sections: 2.1–2.32, 4.1–4.11, 5.1–5.6.2, 5.7–5.7.3, 5.8–5.8.2, 8.10–8.11.3, 5.7–5.7.3, 10.5–10.5.7]

### BOOKS FOR REFERENCE:

1. H.G. Unger, Planar Optical Waveguides and Fibres, Oxford University Press, Oxford (1977).
2. A. Yariv, Principles of Optical Electronics, John Wiley, New York (1984).
3. H.A. Haus, Waves and Fields in Optoelectronics, Prentice Hall, New Jersey (1984).
4. Ajoy Ghatak, Optics, Second Edition, Tata McGraw Hill (2013).
5. B.P. Pal, Fundamentals of Fiber Optics in Telecommunications and Sensor Systems, New Age International, New Delhi (1992).
6. P. K. Rastogi, Optical Measurement Techniques and Applications, Artech House (1997).
7. Dave Birtalan, William Nunley, Optoelectronics: Infrared-Visible-Ultraviolet Devices and Applications, Second Edition, CRC Press (2009).
8. Michael A. Parker, Physics of Optoelectronics, CRC Press (2005).



### COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basic knowledge and concepts of optoelectronics	K1 & K2
CO2	Gain knowledge and importance of fibers and their types	K2 & K3
CO3	Know research-based knowledge about principal, construction and operation of different optoelectronic devices	K3 & K4
CO4	Develop skills pertaining to application potential of diverse optoelectronic devices	K5
CO5	Share ideas with respect to theoretical and experimental aspects of optoelectronic devices	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	M	S	S	S
CO3	M	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong,**

**M – Medium,**

**L – Low**



Program: M.Sc. Physics				
EDC	Course Code: 21PPH2EDC01/ 21PP3EDC01		Course Title: Electronic Appliances	
Semester II/III	Hours/Week 4	Total Hours 60	Credits 4	Total Marks 100

### COURSE OBJECTIVES

1. To understand the basics about electronic devices.
2. To learn the working principles and operation of electronic appliances.

#### UNIT I: ELECTRONIC COMPONENTS

Components – Resistors – Resistance Value – Types of Resistance – Capacitor – Capacitor Value – Types of Resistance – Construction and working of Diodes and Transistors – IC's.

#### UNIT II: ELECTRICAL APPLIANCES

Basic of UPS – Stabilizers – Voltage regulators – Iron Box – Microwave Oven – Refrigerators – Air Conditioners – Washing Machines.

#### UNIT III: ELECTRONIC APPLIANCES

Basics of Radio – TV – LCD Projectors – Digital Camera – Scanners – Video Conferencing.

#### UNIT IV: COMPUTERS

Generation of computer – Block diagram of a Computer – Input Device – Memory Device – Control Unit – Arithmetic logic unit – Output device – RAM – ROM.

#### UNIT V: COMMUNICATION ELECTRONICS

Basics of Mobile Phones – Wireless Phones – Antenna – Internet – Satellites.

#### BOOKS FOR STUDY AND REFERENCE:

1. S. S. Kamble, Electronics & Mathematical Data Book, Allied Publishers Ltd., (1997).
2. William David Cooper, Electronic Instrumentation and Measurement Technique, Second Edition, Prentice Hall, New Delhi (2007).

**COURSE OUTCOMES (CO)**

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

CO Number	CO Statement	Knowledge Level
CO1	Utilize the basic knowledge in electronics field	K1 & K2
CO2	Examine the fundamental of electronic devices	K2
CO3	Gain knowledge on electrical and electronic appliances	K2 & K3
CO4	Demonstrate the working function of home appliances	K4
CO5	Apply research based knowledge to design electronic appliances	K6

**K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6–Create**

**Mapping of COs with POs**

CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong,**

**M – Medium,**

**L – Low**