SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH1C01
Course Title : **CLASSICAL, STATISTICAL AND RELATIVISTIC MECHANICS**
Core : 1
Year : I Semester : I
Hours/Week : 5 Credits : 4

Objectives

To enable the students to know about the

- Lagrangian and hamiltonian formulations
- Canonical equations and transformations for mechanical systems
- Learn the statistical theories and relativistic mechanics in space time continuum.

Learning outcomes:

By the end of the course, the students will be able to

- apply Lagrangian and hamiltonian methods for devoloping equations of motion
- Canonical equations and transformations for mechanical systems
- learn the statistical theories and relativistic mechanics in space time continuum.

UNIT – I: LAGRANGIAN AND HAMILTONIAN FORMULATIONS

Generalized Coordinates – Mechanics of a Particle and System of Particles (Momentum and Energy) D'Alemberts Principle – Lagrange's Equations – Applications (Linear Harmonic Oscillator, Simple pendulum, Isotropic oscillator and Electric circuit) – Hamilton's Equations – Applications (Simple Pendulum, Compound Pendulum and 2D Harmonic Oscillator) – Deduction of Hamilton's Principle – Hamilton's Variational Principle – Principle of Least Action.

UNIT – II: CANONICAL TRANSFORMATIONS

Equation of Canonical Transformations – Infinitesimal Contact Transformations – Lagrange and Poisson Brackets as Canonical Invariants – Equations of Motion in Poisson Bracket form – Jacobi's Identity – Relation between Lagrange and Poisson Brackets – Action Angle Variables – Euler's Angles – Angular Velocity of a Rigid Body – Euler's Equation of Motion.

UNIT – III: CLASSICAL STATISTICS

Basic Elements of Statistical Mechanics – Concept of Ensemble – Gibb's Canonical Ensemble – Grand Canonical Ensemble – Phase Space Entropy – Partition Function – Thermo dynamical Potentials – Internal Energy – Helmholtz Function – Gibb's Function – Free Energy – Maxwell Boltzmann Distribution – Evaluations of Multipliers of Alpha and Beta – Doppler Broadening – Applications of MB Distribution Law - Total Internal Energy and Specific heat at Constant Volume of an Ideal Gas – MB Speed Distribution Law – Most Probable, Average and Root Mean Square Speeds – Entropy of an Ideal Gas.

UNIT – IV: QUANTUM STATISTICS

Bose Einstein Distribution – Determination of e^{α} – Planck's Law of Radiation – Rayleigh – Jeans Law – Wien's Displacement Law – BE Condensation - Fermi Dirac Distribution –Fermi Energy – Fermi Temperature – Fermi Velocity – Mean K.E. – Thermionic Emission – Pauli's Spin Paramagnetism – Comparison of MB, BE and FD Statistics.

UNIT – V: RELATIVISTIC MECHANICS

Einstein's Mass Energy Relation – Relation between Momentum and Energy – Four Vectors – Four Velocity – Energy – Momentum Four Vectors – Four Force – Relativistic Classification of Particles – Relativistic Lagrangian, Hamiltonian function – Relativistic Lagrangian and Hamiltonian of a Charged Particle in an E.M. field.

TEXT BOOK:

1. Author : Gupta and Satyaprakash
   Book Name: Classical Mechanics
   Publication: Kedar Nath Ramnath
   Year:1974- 1975
   Edition:2nd
   UNIT:I,II&III

2. Author : Miss Kamal Singh & S. P. Singh
   Book Name: Elements of Statistical Mechanics
   Publication: S.Chand & Company
   Year: 1988
   Edition: 2nd edition
   UNIT:IV&V

REFERENCE BOOK:

1. Author : H. Goldstein, Addison
   Book Name: Classical Mechanics
   Publication: Wesley Publishers
   Year: 1982 : Edition: 2nd

2. Author : A. J. Poyinton
   Book Name: Introduction To Statistical Physics
   Publication: Longmans, green & Co Ltd, London
   Year: 1967 : Edition: 1st

3. Author : Satyaprakash,
   Book Name: Relativistic Mechanics
   Publication: Pragati Prakasam,
   Year: 1974- 76
   Edition: 3rd edition

4. Author : Brijal and Subramanyam
   Book Name: Thermal and Statistical Physics
   Publication: S. Chand & company
   Year:1989
   Edition:1st

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 17PPH1C02
Course Title : **MATHEMATICAL PHYSICS**
Core : 4
Year : I Semester : II
Hours/Week : 5 Credits : 4

Objectives

To enable the students to know about the mathematical foundation in

- differential equations
- Fourier integrals and transforms
- complex variables
- tensors and beta & gamma functions
- group theory for the discription of the physicsl phenomena

Learning outcomes:

By the end of the course, the students will be able to solve the problems in Physics through

- differential equations
- Fourier integrals and transforms
- complex variables
- tensors and beta & gamma functions
- group theory

UNIT – I: DIFFERENTIAL EQUATIONS

Bessel's differential equation - Recurrence formulae for $J_n(x)$ - Generating function for $J_n(x)$ - Hermite differential equation - Hermite's polynomials - Generating function of Hermite polynomials - Recurrence formulae for Hermite polynomials - Rodrigue's formula - Orthogonality Theorem.

UNIT – II: FOURIER INTEGRALS AND TRANSFORMS

Fourier Integrals - Fourier Integral - Even and odd functions - Complex form of Fourier integral - Examples - Inverse Laplace theorem - Fourier's Transform - Infinite Fourier sine and cosine transforms - Properties of Fourier Transform - Examples.

UNIT – III: COMPLEX VARIABLES

Analytic function - Cauchy Riemann differential equations - CR equations in polar form - Laplace's equation - Examples - Cauchy's integral theorem - Cauchy's integral formula - Taylor's series - Laurent's Series - Singularities of an analysis function - Residues and their evaluation - Cauchy residue theorem - Evaluation of definite integrals (Trigonometric functions of cos θ and sin θ only).

UNIT - IV: TENSORS AND BETA GAMMA FUNCTIONS

Scalars - Contravariant and covariant vectors - Tensors of higher rank - Algebric operation of tensors - Mixed tensor - Symmetric and anti symmetric tensors- Quotient law - Beta and Gamma functions - Definitions - Symmetry property of Beta function - Other forms of Beta function - Evaluation of Gamma function - Other forms of Gamma function - Relation between Beta and Gamma functions – Examples.

UNIT – V: GROUP THEORY

Concept of a group - Abelian group - Generators of finite group - Cyclic groups - Group Multiplication table - Rearrangement theorem - Sub groups - Lagrange's theorem for finite group - Conjugate elements and classes - Group of symmetry of an equilateral triangle - Group of symmetry of square - Representation of a group - Reducible and irreducible representation - Schur's lemmas – The Great Orthogonality theorem.

TEXT BOOK:

Author : Satya Prakash
Book Name: Mathematical Physics with Classical mechanics
Publication: Sultan Chand & sons
Year: Reprint 2007
Edition:2nd UNIT:I- V

REFERENCE BOOK:
Author : B.D.Gupta,
Book Name: Mathematical Physics
Publication: Vikas Publishing house P. ltd.
Year: Reprint, 1997
Edition: 2nd

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 – 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH1C03
Course Title : **ELECTRONICS**
CORE : 3
Year : I Semester : I
Hours/Week : 5 Credits : 4

Objectives:

To understand the basic knowledge of

- analog electrical device and field effect transistors
- utilize negative resistance for circuit analysis
- fabrication technology
- OP-AMPs and its applications
- digital electronics and fundamentals

Learning outcomes:

By the end of the course, the students will be able to

- recognise a variety of exciting high tech products and systems enabled by electronics
- manipulate voltages, currents and resistance in negative resistance and devices
- fabrication technology
- understand the working of OP-AMPs and its applications
- use a mathematical and problem solving approach for digital electronics fundamentals

UNIT - I : FIELD EFFECT TRANSISTOR (FET)
FET – JFET – V-I characteristics – Biasing - FET as Voltage Variable Resistor – Small signal model of FET - Common source Amplifier and Common Drain Amplifier at low and high Frequencies – FET Differential Amplifier – MOSFET Depletion – Enhancement MOSFETs – Characteristics – Logic gates using MOSFETs – Complementary MOSFET.

UNIT - II : NEGATIVE RESISTANCE AND DEVICES
UJT and its characteristics – UJT Relaxation Oscillator – UJT Applications – Tunnel Diode Characteristics and applications – Gunn Diode Mechanism, Characteristics and Applications – PNPN Diode – SCR – Characteristics and Applications – Silicon Controlled Switch (SCS) – IMPATT- TRAPATT- Diodes and applications.

UNIT - III : IC - FABRICATION TECHNOLOGY
Monolithic IC process – Refining and growth of silicon crystals- Silicon wafer preparation-Diffusion of dopant impurity systems-Ion implantation –Thermal oxidation –Photolithography-Fine line lithography-Plasma etching Chemical Vapour Deposition (CVD) –Silicon insulators -Metallization – Monolithic components-Resistors-Capacitors – Diodes –Transistor.

UNIT - IV: OPERATIONAL AMPLIFIER
Characteristics of Ideal and Practical OP AMP – Analysis of 741 – Parameters of OP AMP – Theory of Inverting Amplifier – Virtual Ground – Theory of Non Inverting Amplifier –Solutions of Simultaneous Equations – Solutions of Differential Equations - Sinusoidal oscillators **–** Phase shift oscillator – Wien Bridge Oscillator-Multi vibrator- Schmitt Trigger- Square wave and Triangular wave generators.

UNIT- V: DIGITAL ELECTRONICS FUNDAMENTALS
Number Systems- Binary codes – 8421 Code-Excess 3 code – Grey code- ASCII code – Logic circuits - Sum of Product and Product of Sum - Boolean Algebra-De Morgan's Theorems – Arithmetic Circuits (Half and Full adder – Half and Full subtractor)– Simplification using Karnaugh's Map (2,3 and 4 variables).

TEXT BOOK:

1. Author : Millman and Halkias,
   Book Name: Integrated Circuits
   Publication: Tata McGraw Hill
   Year: 1991
   Edition:8th

2. Author : Malvino and Leech
   Book Name: Digital principles and applications
   Publication: Tata McGraw Hill,
   Year: 1981, Edition: 4th

BOOK	UNIT	CHAPTER
1	I	10
1	II	3
1	III	7
1	IV	16
2	V	1 & 7

REFERENCE BOOK:

1. Author : S.M. Szee
   Book Name: Physics of Semiconductor devices
   Publication: John Wiley & Sons limited,
   Year: 2007,Edition:2nd

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 - 20 onwards Under New CBCS

Programme	: M.Sc Physics	Course Code: 18PPH1EL1	
Course Title	: **PROGRAMMING** IN **C++ AND MATLAB**		
Elective	: 1	Year	: I
Semester	: I	Hours/Week	: 5
Credits			4

Objectives:
To enable the students, to know the

- basic functions of C++ programming
- different classes and objects
- Introduction of Mat lab functions, branching statements,
- Program design, user defined functions
- Features of Mat lab Programs and how they may applied for our day to day life.

Learning outcomes:
By the end of the course, the students will be able to

- understand the functions of C++ programming
- using the different classes and objects in C++ programming
- understand the introduction of Mat lab functions, branching statements,
- Program design, user defined functions
- write the Mat lab Programs and how they may applied for physics concepts

UNIT - I :BEGINNING WITH C ++
Basic Concepts of OOP - Structure of C++ Programme - Tokens, Expressions and Control structures - Basic data types - Symbolic Constants - Operators in C++ - Manipulators - Type Casting - Expressions and their Types - Control structure: if, else, nested if, switch case, while, do while, for, nested for- break - continue and goto statement – Types Functions - Function Prototyping - Call by reference - Return by Reference - Inline Functions - Default Arguments.

UNIT - II :CLASSES AND OBJECTS
Specifying a Class - Defining Member Functions - Static Data Members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions - Returning Objects - Constant Member Functions - Pointers to Members. **Constructors and Destructors:** Constructors - Parameterized Constructors - Copy Constructor - Dynamic Constructor - Constant Objects - Destructors.

UNIT - III :POLYMORPHISM AND FILES
Operator Overloading - Function Overloading - Single Inheritance - Multiple Inheritance - Hierarchical Inheritance - Multi Level Inheritance - Hybrid Inheritance.Classes for File Stream Operations - Opening and Closing a File - Text File Operations - Binary File Operations - Function Templates - Class Templates - Member Function Templates.

UNIT- IV : INTRODUCTION TO MATLAB:
Basics of MATLAB - MATLAB windows - On-line help - Input - Output - File types – Interactive Computation: Matrices and vectors - Input - Indexing - Matrix manipulation -

Creating vectors - Matrix array operations - Arithmetic operations - Relational operations - Logical operations - Elementary math function - Matrix function - Character strings - Manipulating character strings - Eval function - Array operations - Command line functions - Inline function - Anonymous function - Plotting simple graphs.

UNIT - V : PROGRAMMING ON MATLAB

Scripts and functions - Script files - Function files - Executing a function - Sub functions - Nested functions - Language specific features - Use on comments to create online help - Continuation - Global variables - Loops branches and control flow - Interactive input- Application: Linear algebra - Solving a linear system - Gaussian elimination - Eigen values and Eigen vectors - Matrix factorization

TEXT BOOK

1. Author : E. Balagurusamy

   Book Name: Object - Oriented Programming with C++

   Publication: Tata Mc- Graw Hill Publishing Ltd,

   Year: 2001 : Edition:2nd

   UNIT:I- III

2. Author : Rudra Pratap

   Book Name: Getting started with MATLAB - A quick introduction for Scientists and Engineers

   Publication: Oxford University Press

   Year:2005

   UNIT:IV- V

REFERENCE BOOK:

1. Author : Herbert Schildt

   Book Name: C++:The Complete Reference

   Publication: McGraw- Hill

   Year: 1998 : Edition: Third

2. Author : Bjarne Stroutstrup

   Book Name: The C++ Programming Language

   Publications, Addison Wesley

   Edition: 2nd

3. Author : Stephen J. Chapman , Thomson,

   Book Name: MATLAB Programming For Engineers,

   Publication : Learning publishing company,

   Year: 2004.

   Edition:3rd

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 17PPH2C04
Course Title : **ELECTROMAGNETIC THEORY AND ELECTRODYNAMICS**
CORE : 2
Year : I Semester : I
Hours/Week : 5 Credits : 4

Objectives:

To understand the basics of

- electrostatics and magnetostatics
- field equation and conservation law
- propagation of electromagnetic waves and radiating systems
- interaction of emw with matter on macroscopic scale
- relativistic electrodynamics

Learning outcomes:

By the end of the course, the students will be able to

- summarise the fundamentals of electrostatics and magnetostatics
- integrate the field equation and conservation law
- understand the propagation of electromagnetic waves and radiating systems
- understand the interaction of emw with matter on macroscopic scale
- implied the relativistic principle to relativistic electrodynamics

UNIT – I : ELECTROSTATICS AND MAGNETOSTATICS

Dielectrics and its Polarization – External Field of a Dielectric Medium – Electric Field inside a Dielectric – Dielectric Constant and Displacement Vector – Relation Between D, P and E – Polarization of Non-Polar Molecules (Clausius-Mossotti Relation) – Polarization of Polar Molecules.
Ampere's Law of Force – Biot-Savart Law - Ampere's Circuital Law – Magnetic Scalar Potential – Magnetic Vector Potential – Magnetisation and Magnetisation Current – Magnetic Intensity – Magnetic Susceptibility and Permeability.

UNIT – II: FIELD EQUATION AND CONSERVATION LAW

Equation of Continuity – Displacement Current – Maxwell's Equations – Derivations and Physical Significance – Energy in Electromagnetic Fields (Poynting's Theorem) – Poynting Vector – Electromagnetic Potentials – Concept of Guage – Lorentz Guage.

UNIT – III: PROPAGATION OF ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS

Propagation of Electromagnetic Waves in Free Space – Isotropic Dielectrics – Anisotropic Dielectric – Conducting Media – Ionized Gases.
Oscillating Electric Dipole - Radiation from an Oscillating Dipole - Vector Potential – Scalar Potential – Magnetic Induction – Electric Intensity.

UNIT – IV: INTERACTION OF EMW WITH MATTER ON MACROSCOPIC SCALE

Scattering and Scattering Parameters – Scattering by a Free Electron (Thomson Scattering) – Scattering by a Bound Electron (Rayleigh Scattering) – Dispersion - Normal and Anomalous – Dispersion in Gases (Lorentz Theory) – Dispersion in Liquids and Solids.

UNIT – V: RELATIVISTIC ELECTRODYNAMICS

Four Vectors and Tensors – Transformation Equation for Charge - Current Densities – Electromagnetic Potentials – Electromagnetic Field Tensor – Transformation Equations for Electric Field Vectors – Covariance of Maxwell Equations - Four Vector – Four Tensor.

BOOKS FOR STUDY:

1. Electromagnetic Theory — Dr. K. K. Chopra and G. C. Agarwal, K. Nath & Co (Sixth Edition)

BOOK FOR REFERENCE:

1. Electromagnetic Field and Waves — Paul Lorrain and Dale R. Corson, 2nd Edition, CBS Publications

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20onwards Under New CBCS

Programme : M.Sc Physics — Subject Code: 14PPH2C05
Course Title : **MODERN OPTICS**
Core : 5
Year : I — Semester : II
Hours/Week : 5 — Credits : 4

Objectives:

To enable the students to understand the

- analytical methods of theories of nature of light
- concept of laser theories and energy level transaction of laser
- theoretical and experimental concepts of non linear optics and fiber communication

Learning outcomes:

By the end of the course, the students will be able to

- explain the various theories associated with the propagation of light energy in various medium
- discriminate various laser activities and devices
- analyse the different properties related to non linear optics and fiber communication

UNIT - I : PROPAGATION AND NATURE OF LIGHT
Phase velocity – Group velocity – Doppler effect – Energy flow – Liner polarization – Matrix representation of polarization (Jones calculus) – Reflection and refraction at a plane boundary – Amplitudes of reflected and refracted waves – Brewster angle – Phase changes in total internal reflection.

UNIT - II : COHERENCE AND INTERFERENCE
Theory of partial coherent light - Visibility of fringes - Coherent time and Coherent length - Spatial coherence - Fourier Transform spectroscopy - Interference with Multiple beam - Theory of multilayer films.

UNIT - III : LASER OPTICS
Laser rate equations – Three level system – Four level system – Population inversion – Optical resonators – Ruby laser – Helium-Neon Laser – Carbon dioxide laser – Four Level Solid Laser – Semiconductor laser – Holography- Theory of holography – Applications in Communication and Medicine.

UNIT - IV : **NON LINEAR OPTICS**
Nonlinear response – Nonlinear phenomenon and harmonic generation – Phase matching – Susceptibility Tensors – Parametric amplifications –Monley –Row relations – Self focusing – Theory of self focusing – Theory of laser Raman spectroscopy.

UNIT - V : **FIBER OPTICS**
Basic optical laws and definitions – Optical fiber modes and configuration – Step index and Graded index fiber structure – Fiber materials – Fiber fabrication – Mechanical properties of Fibers – Fiber optic communication – Wavelength Division Multiplexing (WDM) – Local Area Network (LAN) – Optical fiber Bus – Nonlinear optical Effects.

TEXT BOOK:

1. Author : Grant R.Fowles
   Book Name: Introduction to Modern Optics
   Publication: Halt,Rineharand Winston, Inc
   Year: Reprint 2007 : Edition:2nd
2. Author : Thyagarajan and Ghatak
   Book Name: Lasers theory and applications
   Publication : Macmillan

3. Author : G.D. Barugh
   Book Name: Essentials of Laser and Nonlinear optics
   Publication: Pragati Prakashan Meerut
   Year: 2000 Edition:1ST

4. Author : Gerd Keiser
   Book Name: Optical Fiber communications
   Publication: Mc GrawHill

Book	Unit	Chapter
1	I	1&2
1	II	4&4
2	III	3
3	IV	8
4	V	2&11

REFERENCE BOOK:

1. Author : Born and wolf
   Book Name: Principles of Optics
   Publication: Pergman Press
   Year: Reprint, 1997
   Edition: 2nd

2. Author : Cherin
   Book Name: Introduction to Optical fibers
   Publication: Mc Graw Hill
   Year: Reprint, 1997
   Edition: 2nd

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 - 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH2C06
Course Title : **QUANTUM MECHANICS - I**
Core : 6
Year : I Semester : II
Hours/Week : 5 Credits : 4

Objectives:

To enable the students to understand the

- basics of quantum mechanics and importance of Schrödinger equations
- wave functions, observables, operators matrix methods involved in the formation of quantum mechanical equation of motion
- problems associated with the subatomic systems
- need for the approximate methods to obtain the solution of the complex problems

Learning outcomes:

By the end of the course, the students will be able to

- discuss the necessity for the study of quantum mechanics
- wave functions, observables, operators matrix methods involved in the formation of quantum mechanical equation of motion
- solve the subatomic problems

UNIT - I : GENERAL FORMALISM OF QUANTUM MECHANICS

Wave packet- Time dependent and Time independent Schrödinger equation –Interpretation of wave function- Probability interpretation- Probability current density-Expectation value - Ehrenfest's theorem-Linear Vector Space –Linear Operator- Eigen function and Eigen values –Hermitian Operator – Postulates of Quantum Mechanics – Simultaneous Measurability of Observables – General Uncertainty Relation – Dirac's Notation.

UNIT - II : EQUATION OF MOTION AND HEISENBERG METHOD

Equation of motion – Schrödinger, Heisenberg and Interaction representation – Heisenberg method – Matrix representation of Wave Function and operator –Properties of Matrix elements –Schrödinger equation in Matrix form – Eigen value problem –Unitary transformations – Linear harmonic oscillator - Matrix method.

UNIT - III : APPLICATION TO ONE AND THREE DIMENSIONAL PROBLEMS

Square well potential with rigid walls and finite walls – Square potential barrier – Alpha emission – Bloch waves in a periodic potential – Kronig – Penney square well periodic potential – Linear harmonic oscillator - Schrödinger method - Operator method – Delta function- Particle moving in a spherically symmetric potential - System of two interacting particles – Rigid rotator – Hydrogen atom - Hydrogenic orbitals.

UNIT - IV : ANGULAR MOMENTUM

Angular momentum operators – Angular momentum commutation relations – Eigen values and Eigen functions of $L^2$and L_z - General angular momentum - Eigen values of J^2 and J_z – Angular momentum matrices – Spin angular momentum – Spin vectors for spin 1/2 system – Addition of angular momenta.

UNIT - V : TIME INDEPENDENT PERTURBATION THEORY

Time independent perturbation theory - Basic concepts – Non degenerate energy levels – Anharmonic oscillator - First order correction – Ground state of helium – Effect of electric field on the ground state of hydrogen – Degenerate energy levels - Ground state theory of deuteron.

TEXT BOOK:1

1. Author : G. Aruldhas,
   Book Name: Quantum Mechanics
   Publication: Prentice- Hall of India Pvt, Delhi
   Year: 2004.

REFERENCE BOOK:

1. Author : P. M. Mathews, T. K. Venkatesan
   Book Name: A Text Book for Quantum Mechanics
   Publication: McGraw- Hill Publishers,

2. Author : L. I Shiff
   Book Name: Quantum Mechanics
   Publication: McGraw- Hill Publishers New York
   Year: 1955

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH2C07
Course Title : **DIGITAL SYSTEM DESIGN AND MICROPROCESSOR**
Core : 7
Year : I Semester : II
Hours/Week : 5 Credits : 4

Objectives:

To understand the basics of

- timer circuits and shift registers, methods of analog to digital conversion
- to familiarize the instruction format and instruction set used in second generation microprocessor
- to develop the programming skill in advanced microprocessor

Learning outcomes:

By the end of the course, the students will be able to

- design the timer circuits and shift registers
- understand the concepts of instruction format and instruction set used in second generation microprocessor
- develop the programming skill in advanced microprocessor

UNIT - I : DIGITAL CIRCUITS
555 Timer internal Structure - 555 Timer as schmitt Trigger - Flip- Flops - NAND Latch - SR, JK, JK Master Slave - Counters - Scale of two to ten counter - Shift Registers - Serial and Parallel - Shift left and Shift right operations - Up Down counters - Multiplexers and Demultiplexers - Decoders and Encoders.

UNIT - II : DIGITAL SYSTEM DESIGN
D/A Conversion - Binary weighted resistor D/A converter - R- 2R resistive adder D/A converter- Counter type D/A converter successive approximation A/D converter- Dual slope A/D converter- Parallel comparator A/D converter, Sample and hold circuits, Multiplexing displays - Digital frequency counter - Digital Multimeter.

UNIT - III : MICROPROCESSOR FUNDAMENTALS AND APPLICATIONS
Introduction to microprocessor - 8085 Architecture - Pin configuration - Addressing modes - - Instruction classification - Instruction set - Data transfer instructions - Arithmetic instructions - Logical and branch instructions- Programmable Peripheral interface (8255A) - Programmable interrupt controller (8259) - Seven segment LED display

UNIT - IV: ADVANCED MICROPROCESSORS 8086
Introduction to microprocessor 8086 - Pin functions of 8086 - 8086 Architecture - Address space and data organization - Hardware organization of the memory address space - Memory read and write bus cycle - Input and output instructions - Input/output port interface minimum mode - Input and output maximum mode signals - Interrupt and 8086 response

UNIT – V: PROGRAMS AND APPLICATIONS OF 8086 MICROPROCESSOR
General program structure – Addition of two 16 bit numbers – multiplication of two 16 bit numbers – Division of a 32 bit number by a 16 bit number - Multibyte addition - Ascending order-bubble start – Display character string - Programmable Interrupt controller(PIC)8259A – Interrupt applications – Stepper motor interface.

TEXT BOOK:

1. Author : Malvino and Leech
   Book Name: Digital Principles & Application
   Publication: McGraw Hill Company
2. Author : V. Vijayendran
   Book Name: Introduction to Integrated Electronics Digital and Analog
   Year:2007 : Edition: 1st, Reprint 2007
3. Author : B. Ram
   Book Name: Fundamentals of Microprocessors and microcomputers
   Publication: Dhaputrai Publications New Delhi
   Year: 2005 : Edition: 6th
4. Author : S.Gonkar
   Book Name: Microprocessor Architecture, Programmming and applications with the 8085
   Publication: Penram International publishing Privt, Ltd. : Year: 1996 : Edition: 5th
5. Author : A. K.Roy Malvino and K.M.Bhurchandi
   Book Name: Advanced Microprocessors And Peripherals : Publication: Tata McGraw- Hill
   Year: 2005 : Edition:16th Reprint
6. Author : V. Vijayendran
   Book Name: Fundamentals of Microprocessor 8086
   Publication: S.Viswanathan Publishers PVT, Ltd.
   Year:2007

REFERENCE BOOK:

1. Author: Albert Paul Malvino, Book Name: Digital Computer Electronics,
   Publication: Tata McGraw- Hill, Year: 1992, Edition:18th Reprint

Book	Unit	Chapter
2	I	8 &11
2	II	13
4	III	
4	IV	
6	V	

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019– 20 onwards Under New CBCS

Programme : M.Sc Physics — Subject Code: 14PPH3C08
Course Title : **QUANTUM MECHANICS- II**
Core : 8
Year : II — Semester :III
Hours/Week : 5 — Credits : 4

Objectives:

To enable the students to understand the

- techniques involved in various approximate methos
- methods involved in framing of schrodinger equations time dependent and independent systems
- many electron problems using Thomas-Fermi and Hartree-Fock equations
- scattering theories, relativistic quantum mechanics and quantum fields

Learning outcomes:

By the end of the course, the students will be able to

- utilise the various approximate methos on subatomic problems
- frame of schrodinger equations for time dependent and independent systems
- many electron problems using Thomas-Fermi and Hartree-Fock equations
- apply the scattering and Dirac theories on potential well problems and relativistic quantum mechanics repectively

UNIT - I : APPROXIMATION METHODS
Variational principle-Rayleigh-Ritz method – Variation method for exited states – Ground state of helium – Hydrogen molecule ion- Ground state of deuteron – WKB Method – Connection formulas –Validity – Barrier penetration – Alpha Emission – Bound states in a potential well.

UNIT - II : TIME DEPENDENT PERTURBATION THEORY
Introduction – First order perturbation – Harmonic perturbation – Transitions to continuum states – Absorption and emission of radiation – Einstein's A and B coefficients - Selection rules.

UNIT - III : MANY ELECTRON ATOMS
Indistinguishable particles – Pauli principle – Inclusion of spin – Spin functions for two-electrons – Spin functions for three-electrons – Helium atom – Central field approximation – Thomas-Fermi model of the atom – Hartree equation – Hartree-Fock equation.

UNIT - IV : THEORY OF SCATTERING
Scattering cross- section - Scattering amplitude partial waves - Scattering by a central potential - Partial wave analysis - Significant number of partial waves - Scattering by an attractive square well potential - Breit- Wiger formula - Scattering length - Expression for phase shifts - Integral equation - Born approximation - Scattering by screened coulomb potential - Validity of born approximation - Laboratory and centre of mass coordinate system.

UNIT - V : RELATIVISTIC WAVE EQUATIONS AND QUANTIZATION OF WAVEFIELDS
Klein-Gordon equation – Interpretation of the Klein-Gordon equation - Dirac's equation for a free particle – Dirac matrices – Covariant form of Dirac equation - Probability density – Plane wave solution – Negative energy states – Spin of the Dirac particle – Radial equation for an electron in a central potential – Hydrogen atom – Lamb shift – Coordinates of the field – Quantum equation for the field – Creation, destriction and number operators – Quantized field energy.

TEXT BOOK:

1. Author : G. Aruldhas,
   Book Name: Quantum Mechanics
   Publication: Prentice- Hall of India Private Limited, New Delhi
   Year: 2004

2. Author : LEONARUN,I.SCHIFF
   Book Name: Quantum Mechanics
   Publication: MacGraw-Hill International edition
   Year: 1988, Edition:3rd

Book	Unit	Chapter
1	I	
1	II	12
1	III	13
1	IV	14
1&2	V	15(1)&14(2)

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 - 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH3C09
Course Title : **SOLID STATE PHYSICS**
Core : 9
Year : II Semester : III
Hours/Week : 5 Credits : 4

Objectives:

To understand the basics of

- crystallography and defects in solids
- phonons through lattice vibration
- specific heat
- elastic and optical properties of solids
- magnetic and dielectric properties

Learning outcomes:

By the end of the course, the students will be able to

- understand the elements of x - ray crystallography and defects in solids
- know about the phonons and the specific heat capacity of the materials at low temperature
- understand about the elastic behaviour of the crystaline solids and photoconductivity
- know about the types of magnetic materials
- understand the polarisisation of dipoles in dielectrics and ferro electricity

UNIT - I : ELEMENTS OF X - RAY CRYSTALLOGRAPHY AND DEFECTS IN SOLIDS
Miller Indices - Point groups - Space group - Reciprocal lattice - Bragg's law interpretation - Structure factor - fcc and bcc structures - Electron density distribution experimental techniques for crystal structure studies (Powder, Laue and Rotation crystal method) - Electron and neutron diffraction methods - Point defects - Colour centres - Line defects - Edge dislocation - Screw dislocation - Dislocation motion.

UNIT - II : LATTICE VIBRATION AND THERMAL CONDUCTIVITY
Phonons in solids - One dimensional atomic chain - (Mono atomic and diatomic) - Momentum of phonons- Optical properties in the infrared - Inelastic scattering of neutrons by phonons - Local phonon model- Umklapp and normal process - Theory of specific heat (Classical, Einstein and Debye Model) - Thermal expansion and thermal conductivity - Boltzmann transport equation .

UNIT - III : ELASTIC AND OPTICAL PROPERTIES OF SOLIDS
Elastic stress components - Analysis of elastic strains - Elastic energy density - Elastic stiffness constants of cubic crystals - Elastic waves in cubic crystals - Experimental determination of elastic constants for cubic crystals - Photo conductivity - Excitation across a gap - Simple model of photo conductor trapping capture - Recombination - Excitons - Luminescence - Activators - Absorption spectra - Emission spectra

UNIT- IV: **MAGNETIC PROPERTIES**
Magnetic permeability - Theory of diamagnetism - Langevin's theory of para magnetism - Weiss theory - Paramagnetic susceptibility of a solid - Calculation of susceptibility - Quantum theory of para magnetism - Determination of susceptibility- Para and diamagnetic materials - Ferromagnetism - Spontaneous magnetism in ferromagnetism - Curie-Weiss law - Ferromagnetic domains - Domain theory- Antiferromagnetism - Structure of ferrites.

UNIT- V : DIELECTRIC PROPERTIES
Microscopic concepts of polarization - Langevin's theory of polarization in polar dielectrics - Local field in liquids and solids - Evaluation of local fields for cubic structure- Computation of E_n- Clausius-Mossotti

Relation - Lorentz formula - Ferroelectricity - Dipole theory of ferroelectricity - Classification of ferroelectric materials - Anti ferro electricity - Piezoelectricity - Complex dielectric constant and dielectric loss - Effects of dielectrics.

TEXT BOOK:

1. Author: B.S.Saxena, R.C.Gupta & P.N. Saxena
   Book Name: Fundamentals of Solid state Physics
   Publication: Pragathi Prakashan
   Year: 2003, Edition:13th

2. Author : S. O Pillai
   Book Name: Solid State Physics
   Publication : New age international
   Year: 1997. Edition: 4th

BOOK	UNIT	CHAPTER
1	I, II, III	1,2,4,5
2	IV,V	9,11

REFERENCE BOOK:

1. Author : S. L. Gupta
   Book Name: Solid state Physics
   Publication: Nath &Co,Meerut
   Year: 1983- 84
   Edition: 4th

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020

For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme: **M. Sc Physics**

Course Title: **Advanced Materials and Characterization** Course Code: 18PPH3EL2

Year: **II** Semester: **III**

Hours/Week: **5** Credits: **4**

Objectives:

To understand the basics of

- to cater the PG students about nature and formation of different materials like thin films, polymers and solar cells.
- to impart the basic knowledge on various techniques available for the processing and characterization of different materials.

Learning outcomes:

By the end of the course, the students will be able to

- know about the methods of deposition and different materials like thin films, polymers and solar cells.
- analysis the electrical and thermal activities and characterization of different materials.

UNIT - I: THIN FILMS:

Thin Film and growth process - Distribution of deposits - Deposition Techniques: Thermal evaporation - Cathodic sputtering – Glow discharge sputtering - RF sputtering – Chemical and Physical vapor deposition – Spray pyrolysis – Spin coating.

THICKNESS MEASUREMENTS: Mass methods – Optical method - photometry, ellipsometry, interferometry - Microbalance technique.

UNIT - II POLYMERIC MATERIALS:

Introduction and types - Photoconductive polymers - Composition and structure of polymers – Polymerization techniques – Chemical oxidative and Electrochemical polymerization - Applications.

SOLAR CELLS: Introduction - History and types of solar cell - Thin film and Dye sensitized solar cell - Minority carrier diffusion - IV characteristics - Solar cell output parameters.

UNIT - III X-RAY ANALYSIS:

Powder X-ray diffraction - Debye-Scherrer technique - Indexing the powder pattern - Calculation of particle size using Scherer method - Lattice constant calculations.

MICROSCOPY ANALYSIS: Scanning Electron Microscope (SEM) - EDAX analysis - Principle and working of Atomic Force Microscopy (AFM) and - Principle of Transmission Electron Microscopy (TEM)

UNIT - IV OPTICAL ANALYSIS:

UV-Vis spectroscopy studies - Band gap calculation - Determination of refractive index and optical activity - Fluorescence and Photoluminescence studies - Determination of direct band gap energy - Electroluminescence - FTIR spectroscopy - determination of different vibrational modes.

UNIT – V ELECTRICAL AND THERMAL ANALYSIS:

Two probe and four probe methods - Hall effect setup measurement - Thermal Analysis: Introduction - Thermogravimetric analysis (TGA) - instrumentation - Determination of weight loss and decomposition products - Differential thermal analysis (DTA) - Cooling curves - Differential scanning calorimetry (DSC) - Instrumentation - Specific heat capacity measurements.

Text Books:

1. Book Name: Thin film fundamentals
   Author: A.Goswami
   Pubblisher: New age international (P) Ltd
   New Delhi (1986)
2. Book Name: Introduction to Nano technology
   Author: C.P. Poole, F.J. Ownes.
   Pubblisher: Wiley, India (2007)
3. Book Name: Solar Cells and their applications
   Author: L.D. Partain
   Pubblisher: John Wiley and Sons, New York (1995)
4. Book Name: Electron and Ion microscopy and Microanalysis principles and Applications
   Author: Lawrence E. Murr
   Publisher: Marcel Dekker Inc., New York (1991)

Reference Books:

1. K.L. Chopra, Thin film phenomena, McGraw-Hill Book companies, New york (1969).
2. G.Timp, Nanotechnology, A.P. Press, Springer (1999)
3. R.H. Bube, Photovoltaic Materials, Imperial (1998).
4. Nanoscale characterization of surfaces & interfaces, N John Dinardo, Weinheim
   Cambridge: Wiley-VCH, 2nd ed., 2000.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 - 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH4C10
Course Title : **CONDENSED MATTER PHYSICS AND NANO SCIENCE**
Core : 10
Year : II Semester : IV
Hours/Week : 5 Credits : 4

Objectives:

To understand the concepts of

- band theory of solids
- semiconductors and superconductors
- nanomaterials and nano devices

Learning outcomes:

By the end of the course, the students will be able to learn the

- electrons in the periodic lattice, effective mass and fermi surfaces
- types of semiconductors, mobility and conductivity
- thermodynamics of superconductors, new superconductors and applications
- nanomaterials and device fabrications and applications

UNIT - 1: BAND THEORY OF SOLIDS

Free electron model - Wave equation in a periodic table and block theorem - Kronig-Penney theory - Acceleration of electron in the periodic lattice and effective mass of the electron - Free electron approximation - Tight binding approximation - Brillouin zones - Construction of fermi surfaces - Experimental methods in fermi surface studies.

UNIT- 11: SEMICONDUCTORS

Intrinsic Semiconductor - Carrier Concentration in Intrinsic Semiconductor – Calculation of density of holes and electrons – Fermi level and its variation with temperatures – Mobility and conductivity – Determination of band gap - Extrinsic Semiconductor – Expression for carrier concentration in n-type and p-type semiconductors – Variation of Fermi level with temperature and impurity concentration – Hall effect - Determination of Hall coefficient.

UNIT- 111: SUPERCONDUCTORS

Superconductivity phenomena - Thermodynamics of superconductivity transition - London equations - Type I and Type II superconductors - BCS theory - Josephson's tunneling - DC and AC Josephson's Effect - New superconductors - Applications - High temperature superconductors - SQUIDS.

UNIT - IV: NANOMATERIALS AND CHARACTERISATION

Classification of Nanostructured materials - Quantum well, quantum wires and quantum dots - Lithography - (Photoresist spinner, positive and negative photoresists) - Fabrication methods - Top down process - Bottom up approach - Plasma assisted deposition process - Deposition by epitaxy - Liquid phase methods - Techniques for synthesis of nanophase materials - Mechanical alloying - Inert gas condensation - Sol-gel techniques - Properties of nanomaterials - Methods for templating the growth of nanomaterials - Ordering of nanosystems.

UNIT - V : NANODEVICES AND THEIR APPLICATIONS

Energies associated with ferromagnetic material - Effect of physical dimensions on magnetic properties of materials - Nanomagnetic materials - Geometric Nanomagnets - Layered Nanomagnets - Carbon nanotubes - Organic field effect transistor (OFET) - Organic light emitting diode (OLED) - Organic photovoltaic - Bilayer organic solar cell using CuPc and PTC - Injection laser - Quantum well lasers - Quantum cascade laser - Single electron tunneling and coulomb blockade behavior - Optical memories - Quantum dot laser.

TEXT BOOK:

1. Author : B.S. Saxena, R.C. Gupta & P.N. Saxena
   Book Name: Fundamentals of Solid state Physics
   Publication: Pragathi Prakashan
   Year: 2003, Edition:13th

2. Author : Dr. S. Jayakumar
   Book Name: Materials Science
   Publication: R.K. Publishers
   Year: 2008

BOOK	UNIT	CHAPTER
1	I,II.III	9,10,11
2	IV,V	4,5,6

REFERENCE BOOK:

1. Author : S. L. Gupta and V.Kumar
   Book Name: Solid state Physics
   Publication: Nath &Co,Meerut
   Year: 1983- 84, Edition: 4th

1. Author : S. O Pillai
   Book Name: Solid State Physics
   Publication : New age international
   Year: 1997. Edition: 4th

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019 – 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 15PPH4C11
Core : 11 **NUCLEAR PHYSICS**
Year : II Semester : IV
Hours/Week : 5 Credits : 4

Objectives

To understand the concept and theory of

- radioacivity
- structure of nucleus
- different nuclear models
- various types of Nuclear reaction
- elementary particles

Learning outcomes:

By the end of the course, the students will be able to

- understand the three modes of decay
- study the theories of nuclear composition
- understand the various nuclear models
- know about the role of elementary particles and their interactions with matter.

UNIT - I : NUCLEAR DISINTEGRATION STUDIES

Alpha Decay: Properties of alpha particles – Velocity and energy of alpha particles - Geiger-Nuttal law – Gamow's theory of alpha decay.

Beta Decay: Properties and beta particles - Fermi's theory of beta decay – Kurie plot - Forms of interaction and selection rules – Electron capture.

Gamma Transitions: Absorption of gamma rays by matter – Interaction of gamma rays with matter – Measurement of gamma rays energies – Dumond bent crystal spectrometer - Internal conversion.

UNIT - II : ELEMENTS OF NUCLEAR STRUCTURE

Theories of nuclear composition (Proton- electron theory, proton neutron theory) – Mass spectroscopy – Bainbridge and Jordan mass spectrograph – Nier's mass spectrometer– Deuteron - Magnetic and quadra pole moment of deuteron – Ground state of deuteron – Excited state of deuteron –Meson theory of nuclear forces - Yukawa potential.

UNIT - III : NUCLEAR MODELS

Liquid drop model - Semi-empirical mass formula – merits and demerits – Shell model – Basic assumption of shell model – Square well potential – The harmonic oscillator - Magic numbers – spin orbit coupling – prediction of the shell model – merits and demerits – Fermi gas model – collective model.

UNIT - IV: NUCLEAR REACTION STUDIES

Types of Nuclear reaction – Conservation laws for nuclear reactions – Kinematics of Nuclear reactions – Exothermic and endothermic reactions – threshold energy – compound nucleus – Nuclear fission – Energy released in fission – Nuclear fusion – Hydrogen burning and solar energy.

UNIT - V : ELEMENTARY PARTICLES

Classification of elementary particles – Fundamental interactions – Electromagnetic, strong, weak and gravitational interactions – Quantum numbers - – Conservation laws – The CPT Theorem - Particle symmetries – SU (2) Symmetry - SU (3) symmetry – Quarks theory.

TEXT BOOK:

1. Author : Pandiya and Yadav , Gupta
   Book Name: Elements of Nuclear Physics
   Physics Publication: Kedar Nath , Ram Nath, New Delhi
   Meerut
   Year: 1997
   Edition:7th

2. Author: V.K. Mittal, R.C. Verma and S.C.
   Book: Introduction to Nuclear and Particle
   Publication:PHI Learning Prt.Ltd.,
   Edition:2011,2nd

REFERENCE BOOKS:

1. Author : D. C. Tayal,
   Book Name: Nuclear Physics
   Publication: Himalaya Publishing, Year: 2003, Edition: 9th

2. Author : B L Cohen
   Book Name: Concept of Nuclear Physics
   Publication: Tata McGraw - Hill, Publisher, New Delhi, Year: 1989

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019- 20 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 15PPH4C12
Core : 12 : **SPECTROSCOPY**

Year : II Semester : IV
Hours/Week : 5 Credits : 4

Objectives:

To enable the students to know about the

- theories of Atomic and molecular spectroscopy
- electronic rotational and vibrational spectra of atoms and molecules
- formation of Deslanders table
- various experimental methods like Raman, IR, NMR etc.,

Learning outcomes:

By the end of the course, the students will be able to learn the

- concepts of Atomic and molecular spectroscopy
- analtical techniques of electronic rotational and vibrational spectra
- formation of Deslanders table
- solving the problems through the Raman, IR, NMR etc., spectra

UNIT - I : ATOMIC AND MICROWAVE SPECTROSCOPY
Spectra of the alkali metal vapours - Normal Zeeman effect - Anomalous Zeeman effect – Lande's 'g' formula - Paschen back effect - Stark effect - Linear molecules - Spherical top molecules - Symmetric top molecules - Study of hindered internal rotation and inversions (elementary ideas only).

UNIT - II : IR AND RAMAN SPECTROSCOPY
Radiation sources - Pure rotational spectra of gaseous diatomic molecules - Molecular vibration - IR rotation vibration spectra of gaseous diatomic molecules - Classical theory of the Raman effect and the selection rule for Raman scattering - Quantum theory of the Raman effect - Pure rotational Raman spectra of diatomic molecules - Raman vibration studies of diatomic molecules.

UNIT - III : UV AND ELECTRONIC SPECTROSCOPY
Born-oppenheimer approximation – vibrational coarse structure:progressions – Deslanders table formation – Intensity of vibrational electronic spectra:The Franck-Condon principle – Molecular orbital theory – chemical analysis by electronic spectroscopy – Effect of solvents of electronic spectra Electronic spectra of transition metal complexes: Selection rules only – Jablonski diagram – Resonance fluorescence – normal florescence – Ultraviolet photo electron spectroscopy.

UNIT – IV: NMR AND NQR SPECTROSCOPY
NMR Quantum mechanical description - Classical description - Bloch equations - Relaxation process - Mechanisms of spin lattice relaxation – chemical shift - Mechanisms of spin-spin relaxation - Experimental technique:The spectrometer:Basic requirements only – Fourier transform spectrometer.
NQR:Fundamental requirements - General principles - Integral spins –Experimental detection of NQR frequencies – the Super regenerative oscillator - Continuous wave oscillator – Chemical application (main uses only).

UNIT – V: ESR AND MOSSBAUER SPECTROSCOPY
The ESR experiment - Thermal equilibrium and relaxation - ESR spectrometer - Reflection cavity and microwave bridge - Magnetic field modulation - Characteristics of the g-factor - Hyper fine structure - Energy levels for a radical with S=1/2 and I=1/2 - Mossbauer effect – Recoilness emission and absorption - Mossbauer spectrum - Experimental methods – Chemical isomer shift.

TEXT BOOK:

1. Author : B.P.Straughan and S.Walker
   Book Name: Spectroscopy: Volume (I, II & III)
   Publication: John wiley and sons, New York
   Year: 1976
   Edition:

2. Author : C.N. Banwell
   Book Name: Fundamental of Molecular Spectroscopy
   Publication:McGraw Hill Edu.Pvt.Ltd.,
   Edition Year: 2013

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2019– 20onwards Under New CBCS

Programme : M.Sc Mathematics Subject Code: 13PMA3EL3
Course Title : Elective (IDE): **RELATIVITY AND WAVE MECHANICS**
Year : II Semester : III
Hours/Week : 5 Credits : 4

Objectives:

To enable the students to know about the

- theories of relativistic mechanics
- origin of wave mechanics
- formalism of wave mechanics and simple applications

Learning outcomes:

By the end of the course, the students will be able to

- understand the theories of relativistic mechanics
- origin of wave mechanics
- formalism of wave mechanics and simple applications

UNIT - I : RELATIVISTIC MECHANICS
Einstein's mass-energy relation - Relation between momentum and energy - Four vectors - Four velocity - Energy - Momentum four vectors - Four force - Relativistic classification of particles - Relativistic Lagrangian, Hamiltonian function - Relativistic Lagrangian and Hamiltonian of a charged particle in an EM field.

UNIT - II : ORIGIN OF WAVE MECHANICS
Failure of classical mechanics - De Broglie's Theory - Davisson and Germer experiment - G.P Thomson experiment - Uncertainity principle - Illustration of Heisenberg's uncertainity principle - Electron microscope - Advantages over ordinary optical microscope - Applications.

UNIT - III : FORMALISM OF WAVE MECHANICS
Postulates of Quantum Mechanics - Equation of motion of matter waves - Time Independent Schrödinger equation - Schrödinger equation for a free particle - Time Dependent Schrödinger's Equation - Physical Interpretation of the Wave Function - Normalized and orthogonal wave functions - Solution of the Schrödinger Equation - Values of dynamical quantities - Probability current density - Particle flux - Ehrenfest theorem - Eigen value and Eigen function.

UNIT - IV : SIMPLE APPLICATIONS: (1D PROBLEMS)
Solution of Schrödinger's equation for a particle in a box - Linear harmonic oscillator - One dimensional square well potential - Step potential - Rigid rotator.
Operators - Operator formalism in Quantum Mechanics - Dynamical variables as operators - Hamiltonian operator - Commutation relation between position and momentum - Commutation rules for the components of orbital angular momentum - Ladder operators.

UNIT - V : PERTURBATION THEORY
First order Time independent perturbation theory - Perturbed harmonic oscillator - Zeeman effect (without electron spin) - First order Stark effect in hydrogen atom - Helium atom.

BOOKS FOR STUDY:
1. Quantum mechanics by Satya prakash and C.K. Singh
2. Modern physics by Murugesan. R, S. Chand & Company, 1995, 5th edition
3. Relativistic Mechanics by Satya prakash, Pragati Prakashan, 5th edition

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2014 - 15 onwards Under New CBCS

Programme : M.Sc Physics Subject Code:14PPH2CP1
Course Title : **GENERAL EXPERIMENTS**
Core Practical : I
Year : I Semester: II
Hours/Week : 3 Credits : 3

Any TWELVE of the following Experiments:

1. Young′s modulus - Cornu′s method - Elliptical fringes
2. Polarizability of liquids - Spectrometer
3. Compressibility of liquids - Ultrasonic diffraction
4. Michelson′s interferometer
5. Fabry - Perot interferometer
6. Planck′s constant - Photoelectric emission
7. Thermistor- Temp. coefficient of resistance and band gap energy
8. Stefan′s constant - Vacuum Diode/Stefan′s apparatus
9. Thermal conductivity - Forbe′s method
10. e/m- Thomson′s method
11. e/m - Helical method
12. e/m - Magnetron method
13. Electronic charge - Millikan′s oil drop method
14. Rydberg′s constant - Hydrogen spectrum
15. Boltzmann′s constant - Boltzmann′s apparatus
16. Hysteresis curve of Ferromagnetic materials - CRO method

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2014 - 15 onwards Under New CBCS

Programme : M. Sc Physics Subject Code:14PPH2CP2
Course Title : **ELECTRONICS**
Core Practical : II
Year : I Semester : II
Hours/Week : 3 Credits : 3

Any TWELVE of the following Experiments:

1. IC regulated power supply - 5, 9, 12 - 0 - 12 V, 1 amp
2. FET Characteristics
3. UJT Characteristics
4. SCR Characteristics
5. MOSFET Characteristics
6. DIAC Characteristics
7. TRIAC Characteristics
8. Photo Diode and Photo Transistor
9. UJT relaxation oscillator
10. Astable multivibrator - 555 IC
11. Phase shift oscillator - 741 IC
12. Wien bridge oscillator - 741 IC
13. Wave form generators - 741 IC (Sine, Square and Triangular)
14. Band gap energy and Carrier concentration - Ge - Four Probe method
15. Half adder, Full adder and 4 - Bit binary adder
16. Half subtractor, Full subtractor and 4 - Bit binary subtractor

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2014 - 15 onwards Under New CBCS

Programme : M.Sc Physics Subject Code :14PPH2EP1
Course Title : **SIMULATION IN PHYSICS - C++ PROGRAMMING**
Elective Practical : I
Year : I Semester : II
Hours/Week : 4 Credits : 4

Any Fifteen of the following Experiments:

1. Moment of inertia of Circular disc and Solid sphere.
2. Moment of inertia of Spherical sphere and Solid cylinder.
3. Temperature conversion from F to C and C to F.
4. Plank's law of radiation - Determination of energy density.
5. Resolving and dispersive power of grating
6. Solar spectrum- Determination of photon energy.
7. Rayleigh Jean's Law - Determination of energy density
8. SCR power control - Determination of power output.
9. AND, OR and NOT gates.
10. NAND and NOR gates.
11. Radioactive decay of the element
12. Mosley's law- Determination of frequency and wavelength
13. Radius, orbital wavelength and energy levels of atoms - Bohr model.
14. Lyman, Balmer and Paschen series - Wave number.
15. Brackett and Pfund series - Wave number.
16. Determination of the diameter of molecules.
17. Determination of Molecular weight of compounds.
18. Band gap energy of thin films.
19. Solution of differential equation by Runge - Kutta method.
20. Integration by Simpsons 1/3 rule.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2016 - 17 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 16PPH4CP3
Course Title : **ADVANCED EXPERIMENTS**
Core Practical : III
Year : II
Semester : IV
Hours/Week : 3 Credits : 3

Any Fifteen of the following Experiments:

1. Determination of Dipole moment of liquids and solids.
2. Susceptibility of liquids - Quincke's method.
3. Susceptibility of liquids - Gouy's method.
4. Geiger Muller counter - Characteristics of GM tube and absorption coefficient of Aluminium- Beta & Gamma rays.
5. Determination of Band gap energy - Michelson interferometer.
6. Study of Hall Effect in semiconductors.
7. Synthesis and study of conductivity of electro- deposited conducting polymers.
8. X - ray powder photograph - Debye - Scherrer formula.
9. Deposition and Study of conductivity and activation energy of spray pyrolysis coated SnO_2 films.
10. Study of transmission of light through optic fiber - Numerical Aperture and Bending loss.
11. Elastic constants in solids - ultrasonic method.
12. Ferroelectric materials - Curie Temperature.
13. Study of Zeeman Effect.
14. Laser- Determination of refractive index of given liquids.
15. Determination of thickness of wire using laser
16. Determination of absorbitivity of CoO selective coating.
17. Determination of dielectric constant : Non – Polar liquids
18. Deposition of Black Cobalt selective surface by spray pyrolysis method and deposition of Carbon by Direct method-Temperature measurements.
19. Solar cells- I-V characteristics.
20. Solar cells- variable temperature characteristics.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2014 - 15 onwards Under New CBCS

Programme : M.Sc Physics Subject Code : 14PPH4CP4
Course Title : **SPECIAL ELECTRONICS**
Core Practical : IV
Year : II
Semester : IV Hours/Week : 3
Credits : 3

Any Fifteen of the following Experiments:

1. Gray code converter.
2. A/D Converter using 741 IC.
3. Flip flops- RS, JK and MS.
4. Wave form generator – 8038.
5. D/A Converter using 741 IC.
6. Study of Multiplexers and Demultiplexers.
7. Decade counter.
8. Digital timers and Frequency Dividers.
9. Counters-MOD-2 to MOD-10.
10. Microprocessor - Musical Tone generator.
11. Microprocessor - Seven segment Running display.
12. Microprocessor - Stepper motor controller
13. Microprocessor - Traffic light interface.
14. Microprocessor - A/D and D/A converters.
15. C++ Program - Evaluating polynomial by Lagrange's interpolation method.
16. C++ Program - Computing area under a curve.
17. C++ Program - Evaluating Sine, Cosine and Exponential series.
18. C++ Program - Solving differential equation by Runge - Kutta method.
19. C++ Program - Evaluating integral by Simpson's 1/3 rule .
20. C++ Program-. Roots of the equation by Newton- Raphson method.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE - 641 020
For candidates admitted from academic year 2014 - 15 onwards Under New CBCS

Programme : M.Sc Physics Subject Code: 14PPH4EP2
Course Title : **SIMULATION IN PHYSICS THROUGH MATLAB PROGRMMING**
Elective- Practical: II
Year : II
Semester : IV
Hours/Week : 4
Credits : 4

Any Fifteen of the following Experiments

1. Projectile on a horizontal surface (g).
2. Moment of inertia of circular disc, Solid sphere, Spherical sphere and Solid cylinder.
3. Simple harmonic motion- Lissajous Figures (g).
4. Temperature conversion from F to C and C to F (g).
5. Plank's law of radiation and Rayleigh Jeans law- Verification (g).
6. Resolving and dispersive powers of grating.
7. Solar spectrum- Determination of photon energy.
8. Determination of currents through resistors- Maxwell's mesh method.
9. SCR power control (g).
10. 8421 code conversion and AND, OR, NOT, NAND, NOR, gates.
11. Radioactive decay (g).
12. Mosley's law- Verification (g).
13. Radius, orbital wavelength and energy levels of atoms- Bhor model.
14. Lyman, Balmer, Paschen, Brackett and Pfund series- Wave number.
15. Determination of the diameters of molecules.
16. Molecular weight of compounds.
17. Particle in a box and Hydrogen atom wave function probability (g).
18. Band gap energy of thin films.
19. Solution of differential equation by Runge- Kutta method.
20. Integration by Simpsons 1/3 rule.

Note: (g) refers Graphical output.