Department of Physics

B.Sc.,

M.Sc.,

M.Phil

B.Sc., Physics

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

COURSE STRUCTURE (w.e.f 2014 -17batch onwards)

Semester – I

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
Part I Tamil	P111	Ikkala Ilakkiyam	6	3	90	25	75	100
Part II English	P211	English Through Prose	6	3	90	25	75	100
Core	MP11	Properties of Matter	4	4	60	25	75	100
Core	MP12	Heat and Thermodynamics	4	4	60	25	75	100
Core Elective I	EMP11	Energy Physics/Modern Optics	4	3	60	25	75	100
Lab	MPL21	Major Practical	2	-	30	-	-	-
Value Education	VE1	Value Education-I	2	2	30	15	35	50
Environmental Studies	ES	Environmental Studies	2	2	30	15	35	50
TOTAL			**30**	**21**	450	155	445	600

Semester – II

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
Part I Tamil	P121	Bhakthi Illakiyamum Sitrillakiyam	6	3	90	25	75	100
Part II English	P221	English Through Drama	6	3	90	25	75	100
Core	MP21	Mechanics	7	7	105	25	75	100
Core	MP22	Optics	7	7	105	25	75	100
Lab	MPL21	Major Practical	2	3	30	40	60	100
Skill Based Elective 1	ESP21	Mathematical Physics / Physics in Everyday Life	2	2	30	15	35	50
TOTAL			**30**	**25**	450	155	395	550

Semester – III

Course	Code No	Subject		Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Part I Tamil	P131	Kappiya Illakiyam		6	3	90	25	75	100
Part II English	P231	English Through Poetry		6	3	90	25	75	100
Core	MP31	Programming in C		6	5	90	25	75	100
Lab	MPL41	Major Practical		2	-	30	40	60	100
Allied	AP31(C)	Allied – I (Chemistry)	Theory	4	4	60	25	75	100
			Practical	2	-	30	-	-	-
Non Major Elective I	NME 1	Non Major Elective I		2	2	30	15	35	50
Value Education	VE2	Value Education-II		2	2	30	15	35	50
TOTAL				**30**	**19**	450	170	430	600

Semester – IV

Course	Code No	Subject		Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Part I Tamil	P141	Pandai Illakiyam		6	3	90	25	75	100
Part II English	P241	English Through Fiction		6	3	90	25	75	100
Core	MP41	Electricity & Magnetism		6	5	90	25	75	100
Skill Based Elective 2	ESP41	Medical Physics – I / Practical Electric circuits – I		2	2	30	15	35	50
Lab	MPL41	Major Practical		2	3	30	40	60	100
Allied	AP41 (C)	Allied – I (Chemistry)	Theory	4	4	60	25	75	100
			Practical	2	2	30	40	60	100
Non Major Elective II	NME 2	Non Major Elective - II		2	2	30	15	35	50
TOTAL				**30**	**24**	450	210	490	700

Semester – V

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Core	MP51	Elementary Solid State Physics	4	4	60	25	75	100
Core	MP52	Analog Electronics	4	4	60	25	75	100
Core	MP53	Modern Physics	4	4	60	25	75	100
Core Elective II	EMP51	Experimental Design / Elementary Quantum Mechanics	4	3	60	25	75	100
Lab	MPL61	Major Practical (General)	3	-	45	-	-	-
Lab	MPL62	Major Practical (Electronics)	3	-	45	-	-	-
Allied	AP51(M)	Allied Mathematics	6	5	90	25	75	100
Value Education	VE 3	Value Education-III	2	2	30	15	35	50
Self Study Paper	MPSS	Visual Astronomy	-	(Extra 5)*	-	-	100*	100*
TOTAL			**30**	**22**	450	140	410	550

*** Carries Extra 5 credits that do not form part mandatory credits (140) required for completion of the course.**

Semester – VI

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Core	MP61	Molecular Spectroscopy	4	4	60	25	75	100
Core	MP62	Industrial Physics	4	4	60	25	75	100
Core	MP63	Digital Principles and Applications	4	4	60	25	75	100
Core Elective III	EMP61	Applied Electronics / Introduction to Nanoscience	4	3	60	25	75	100
Skill Based Elective 3	ESP61	Medical Physics –II / Practical Electric circuits – II	2	2	30	15	35	50
Lab	MPL61	Major Practical (General)	3	3	45	40	60	100
Lab	MPL62	Major Practical (Electronics)	3	3	45	40	60	100
Allied	AP61(M)	Allied Mathematics	6	5	90	25	75	100
TOTAL			30	**28**	450	220	530	750
Part V		**NCC/ NSS/ PE**		**1**		25	75	100
TOTAL CREDITS FOR SEMESTERS I to VI				**140**				

A) CONSOLIDATION OF CONTACT HOURS AND CREDITS: UG

Semester	Contact Hrs/ Week	Credits
I	30 hrs.	21
II	30 hrs.	25
III	30 hrs.	19
IV	30 hrs.	24
V	30 hrs.	22
VI	30 hrs.	28
Part – V	--	1
Total	180 hrs	140

B) Curriculum Credits: Part wise

Part I	**Tamil**	**4x3 = 12 Credits**
Part II	**English**	**4x3 = 12 Credits**
Part III	**Core**	**= 68 Credits (10+15+5+8+12+18)**
	Allied	**5x4 = 20 Credits**
	Core Electives	**3x3 = 09 Credits**
Part IV	**Value Education**	**3x2 = 06 Credits**
	Environmental studies	**1x2 = 02 Credits**
	Skill Based Electives	**3x2 = 06 Credits**
	Non – Major Electives	**2x2 = 04 Credits**
Part V		**1x1 – 01 Credits**
	Total	**140 Credits**

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :MP11**
Semester : I **No. of Hrs alloted :4**
Paper : Core **No. of Credits :4**
Title of the paper : PROPERTIES OF MATTER

COURSE OBJECTIVES:

- To discuss the moduli of elasticity as a property of matter.
- To throw light on the effect of these properties of matter on day to day life activities.
- To enable the students to apply these properties for the betterment of life.

UNIT I: ELASTICITY

Introduction-different moduli of elasticity-relation between angle of shear and linear strain-relation between volume strain and linear strain-behaviour of a wire under progressive tension-relation between the elastic moduli-torsion of a body-determination of rigidity modulus(static torsion method)-work done in twisting a wire-torsional oscillations of a body-bending of beams-expression for bending moment depression at the midpoint of a beam loaded at the middle-uniform bending of a beam-measurement of Young's modulus.

UNIT II: VISCOSITY

Introduction-streamline flow and turbulent flow-Poiseuille's formula for the flow of liquid through a capillary tube-corrections to Poiseuille's formula-comparison of viscosities-Ostwald's viscometer-Poiseuille's method for determining the coefficient of viscosity of a liquid-terminal velocity and Stoke's formula-Stoke's method for the coefficient of viscosity of a viscous medium-variation of viscosity with temperature and pressure-friction and lubrication.

UNIT III: SURFACE TENSION

Introduction-explanation of surface tension on kinetic theory-work done in increasing the area of a surface-work done in blowing a bubble-forms of liquid drops-angle of contact-spreading of one liquid over another-pressure difference across a liquid surface-excess pressure inside a curved liquid surface-Jaegar's method of determining surface tension-variation of surface tension with temperature-Quinke's method- vapour pressure over flat and curved surfaces-drop weight method of determining the surface tension of a liquid-experiment to determine the interfacial tension between water and kerosene.

UNIT IV: DIFFUSION AND OSMOSIS

Introduction- Fick's law of diffusion- experimental determination of coefficient of diffusion-Graham's law of diffusion of gases-Introduction-experimental determination of osmotic pressure-laws of osmotic pressure-osmosis and vapour pressure of a solution-osmosis and boiling point of a solution- osmosis and freezing point of a solution –determination of molecular weight- determination of percentage of dissociation of an electrolyte.

UNIT V: GRAVITATION

Newton's law of gravitation- Kepler's law of planetary motion- determination of G-Boy's experiment-gravitational field and gravitational potential-gravitational potential and field due to a spherical shell- gravitational potential and field due to a solid sphere-variation of g with latitude- variation of g with altitude- variation of g with depth- the compound pendulum.

TEXTBOOK:

Properties of Matter-R.Murugeshan [S.Chand & Company ltd-2001 (ISBN: 81-219-0605-9)].

REFERENCE BOOK:

Elements of Properties of Matter-D.S .Mathur [S.Chand & Company ltd-2005 (ISBN:81-219-0815-9)].

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DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No**	**: MP12**
Semester	**: I**	**No of Hrs allotted**	**: 4**
Paper	**: Core**	**No of Credits**	**: 4**

Title of the paper : HEAT AND THERMODYNAMICS

COURSE OBJECTIVES:

- To explain the behavior of thermal expansion of solids, liquids and gases
- To throw light on the elementary aspects underlying changes of state
- To discuss the fundamental laws of thermodynamics, concept of phase transitions in matter and to the elements of statistical thermodynamics

UNIT – I EXPANSION

Expansion of Solids – Coefficient of Linear Expansion – Relation between α & β – Coefficient of Cubical expansion – Relation between α and √ – Determination of coefficient of Linear expansion: Spherometer method, Optical lever method – Expansion of Liquids – Relation between $\sqrt{}_r$ and $\sqrt{}_a$ - Determination of coefficient of real expansion of liquid by Dulong and Petit's method – Anomalous expansion of water - Expansion of Gases – Determination of the Pressure coefficients of a gas – Determination of the volume coefficient of a gas.

UNIT – II CHANGE OF STATE

Change of state – Latent heat of Fusion – Laws of Fusion – Determination of Latent heat of Fusion of ice – Vapourisation and Condensation – Latent heat of Vapourisation – Determination of Latent heat of steam – Cooling effect due to Vapourisation – Ammonia ice plant – Solid carbon dioxide – Gas and vapour - Saturated and un Saturated Vapours - Vapour pressure of liquids – Triple point - Gibbs Phase rule

UNIT – III ZEROTH AND FIRST LAW OF THERMODYNAMICS

Thermodynamic system – Zeroth law of thermodynamics – Concept of heat – Heat – A path function – work – a path function – comparison of heat and work – First law of thermodynamics – Applications – Isothermal, Adiabatic, Isochoric, Isobaric process – Gas equation during adiabatic process – Slopes of adiabatic and isothermals – Reversible and Irreversible process.

UNIT – IV SECOND AND THIRD LAW OF THERMODYNAMICS

Second law of thermodynamics – Carnot's reversible engine – Carnot's Theorem – Entropy and second law of thermodynamics – Change in entropy in a reversible process – Third law of thermodynamics – Temperature – entropy diagram – entropy of a perfect gas – zero point energy – Maxwell's thermo dynamical relations – Helmholtz function – thermo dynamic potentials - enthalpy – Maxwell's equations – First order Phase transition.

UNIT – V STATISTICAL THERMODYNAMICS

Statistical Mechanics – Statistical equilibrium – Probability theorems in statistical thermodynamics – Maxwell - Boltzmann distribution law – Maxwell - Boltzmann distribution law in terms of temperature – Quantum Statistics – Phase space – Fermi - Dirac distribution law – Electron gas – Bose - Einstein distribution law Photon gas – Comparison of three statistics.

TEXT BOOK:

BRIJLAL & SUBRHAMANYAM, : Heat and Thermodynamics, S.Chand & Co.2006 (ISBN: 81-219-0417-X).

REFERENCE BOOK:

P.K.NAG: Basic and applied Thermodynamics, Tata McGraw – Hill company Ltd., 2005.

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DEPARTMENT OF PHYSICS
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Course	**: B.Sc., Physics**	**Code No.**	**:EMP11(E)**
Semester	**: I**	**No. of Hrs allotted**	**: 4**
Paper	**: Core Elective**	**No. of Credits**	**: 3**
Title of the paper	**: ENERGY PHYSICS**		

COURSE OBJECTIVES:

- To create awareness among students about the growing energy needs, the conventional and non conventional sources of energy and the methods of proper utilization.
- To explain to the students the role of sun as a repository of energy and the methods of harnessing it.
- To help students visualize the concept of "waste" as an alternative to meet the growing demands for energy.

UNIT-I INTRODUCTION TO ENERGY SOURCES

Energy sources and their availability – Conventional Energy Sources – Coal- oil- gas- agriculture and organic wastes- water power- nuclear power- thermal and breeder reactors- the nuclear option- Non-Conventional Energy Sources- solar energy- - wind energy-energy from bio-mass and bio-gas-ocean thermal energy conversion- tidal energy- geothermal energy- hydrogen energy- fuel cells- magneto hydro- dynamics generator-thermionic converter-thermo electric power.

UNIT-II SOLAR RADIATION AND ENERGY CONVERSION

Solar constant – Solar radiation at the Earth's surface – Solar radiation measurements - Physical principles of the conversion of solar radiation into heat – Flat plate collectors – A typical liquid collector-thermal analysis of flat plate collector and useful heat gained by the fluid.

UNIT-III SOLAR CONCENTRATING COLLECTORS AND ENERGY STORAGE

Focusing Type – parabolic Type – non-focusing type – compound parabolic concentration – Performance analysis of a cylindrical parabolic concentrating collector – Selective absorber coating – Solar thermal storage – Solar pond- Construction and operation non-convective solar pond.

UNIT-IV BIO-MASS ENERGY

Biomass conversion Technologies – Biogas generation – Classification of bio-gas plant- Types- KVIC, Pragati, Janta and Deena bandhu model biogas plant- Gasification of Biomass – Gasifier – Construction and operation of down draught and up draught gasifier – Application of Gasifiers.

UNIT-V ENERGY CONSERVATION

Principles of Energy conservation and Energy Audit – Energy Conservation Approach and Technologies – Co-generation – waste-heat utilization.

TEXT BOOK:

Non-conventional Energy Sources – G.D. Rai, Khanna Publishers, 1997, First Reprint, Delhi.
Unit I Pg.4-11, 15-35
Unit II Pg. 47-53, 60-64, 73-81
Unit III Pg. 102-111, 112-122,125-131,138-145
Unit IV Pg.319-324, 327-331, 337-341,342-357,395-405, 408-411
Unit V Pg.827-842

REFERENCE BOOK:

Solar Energy – Principles of Thermal Collection and Energy Storage – S.P. Sukhatme TMH, 1997, Second Reprint New Delhi.

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DEPARTMENT OF PHYSICS
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Course	**: B.Sc., Physics**	**Code No.**	**: EMP11(M)**
Semester	**: I**	**No. of Hrs allotted: 4**	
Paper	**: Core Elective**	**No. of Credits**	**: 3**

Title of the paper: MODERN OPTICS

COURSE OBJECTIVES:

- To provide a broad overview of the various optical instruments.
- An introduction to laser and the basis of holography is given.
- An emphasis is given to the fibre optics and nonlinear optical phenomena**.**

UNIT I: OPTICAL INSTRUMENTS

The Eye – Camera – Size of an object – The Simple Magnifier – Field of view – Stops and Pupils – Objective and Eyepiece – Huygen's Eyepiece – Ramsden Eyepiece – Comparison of Ramsden Eyepiece with Huygen's Eyepiece – Compound Microscope – Telescopes – Reflecting Telescope – Constant Deviation Spectrometer – Abbe Refractrometer.

UNIT II: LASERS

Attenuation of light in an optical medium – thermal equilibrium – Interaction of light with matter – Einstein`s relations-Light Amplification- Population inversion – Active medium – Pumping – Metastable states –Principal pumping schemes – Optical resonant cavity-Axial modes-Types of lasers – Ruby, He-Ne, CO_2 Laser – Laser beam characteristics-Applications.

UNIT III: HOLOGRAPHY

Introduction - Principle of holography – Theory- Important properties of a hologram – Advances -Applications.

UNIT IV: FIBRE OPTICS

Introduction – Optical Fiber – Critical Angle of Propagation – Modes of Propagation – Acceptance Angle – Fractional Refractive index change – Numerical Aperture – Types of Optical Fibers – Normalized Frequency – Pulse Dispersion – Attenuation – Applications – Fiber Optic Communication Systems – Advantages.

UNIT V: NON – LINEAR OPTICS

Introduction – Wave Propagation and Momentum Conservation – Linear Medium – Nonlinear Polarization – Second Harmonic Generation – Phase Matching – Sum and Difference Frequency Generation – Parametric Oscillation – Self-Focussing of Light – Stimulated Raman Scattering.

TEXT BOOK:

N. Subrahmanyam, BrijLal & M.N. Avadhanulu; *A Text Book Of Optics, S*. CHAND, 2006 (ISBN:81-219-2611-4).

REFERENCE BOOK:

F.A. Jenkins, H.E. White, *Fundamentals Of Op*tics (4th Edition) Mcgraw- Hill Book Company,1981(ISBN:0-07-032330-5).

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DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP21**
Semester	**: II**	**No. of Hrs allotted**	**: 7**
Paper	**: Core**	**No. of Credits**	**: 7**

Title of the paper: MECHANICS

COURSE OBJECTIVES:

- To discuss the laws of motion and the concept of central force
- To explain the principles of projectile motion and dynamics of rigid bodies.
- To interpret and understand oscillations of mechanical systems.

UNIT I: LAWS OF MOTION AND CENTRAL FORCE

Newtons first law of motion-second law of motion-resistive force -constant force and resistive force -conservative force-motion in a plane –cylindrical polar coordinates- Spherical polar coordinates-Uniformly rotating frame of reference-Focault`s pendulum- Coriolis forces and motion relative to earth.

UNIT II: SYSTEM OF PARTICLES

Dynamics of a system of particles and concept of Rigid bodies-centre of mass coordinates – Centre of mass of a rigid body-motion of centre of mass and linear momentum-angular momentum and torque-angular momentum of a system and centre of mass –conservation of angular momentum-Collisions-Inelastic collision-coefficient of restitution.

UNIT III DYNAMICS OF RIGID BODIES I

Rigid bodies-rotational kinetic energy, moment of inertia and its physical significance-angular acceleration-angular momentum-law of conservation of angular momentum-torque-torque as a cross product of F & r –analogy between translatory motion and rotatory motion –work done by a torque- Theorem of perpendicular axes-theorem of parallel axes

UNIT IV: DYNAMICS OF RIGID BODIES II

Moment of inertia of thin uniform bar- Moment of inertia of a rectangular lamina- Moment of inertia of a uniform circular disc- Moment of inertia of an annular disc- Moment of inertia of a hollow cylinder - Moment of inertia of a solid sphere- Moment of inertia of a spherical shell-Moment of inertia of a solid cone-Routh`s rule-Kinetic energy of a body rolling on a horizontal plane-acceleration of a body rolling down an inclined plane.

UNIT V: OSCILLATIONS

Linear harmonic oscillator-energy of a simple harmonic oscillator –simple harmonic oscillations of a loaded spring-Helmholtz resonator-Oscillations of two masses connected by a spring-Damped harmonic oscillators-energy of a damped harmonic oscillator.

TEXT BOOK :

MECHANICS AND ELECTRODYNAMICS ,Brijlal, N.Subrahmanyam&Jivan Seshan,
S.Chand & Company ltd-2005 (ISBN:81-219-2591-6)]
UNIT I: Chapter 4 [4.1-4.9, 4.11]
UNIT II: Chapter 6 [6.1-6.10]
UNIT III: Chapter 7 [7.1-7.11]
UNIT IV: Chapter 7[7.12, 7.15, 7.18-7.21, 7.23, 7.26-7.29]
UNIT V: Chapter 8[8.2-8.4, 8.10, 8.11, 8.15, 8.16]

REFERENCE BOOK:

Elements of Properties of Matter-D.S .Mathur[S.Chand & Company ltd-2005 (ISBN:81-219-0815-9)]

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DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP22**
Semester	**: II**	**No. of Hrs allotted**	**: 7**
Paper	**: Core**	**No. of Credits**	**: 7**
Title of the paper	**: OPTICS**		

COURSE OBJECTIVES:

- To provide a broad overview of the elementary concepts of optics.
- To discuss in detail the three crucial phenomena in Optics viz. Interference, Diffraction and Polarization and their occurrence in day to day life.

UNIT I LIGHT AND LENS

Introduction to light -Fermat's Principle of Least time-Rectilinear propagation of light-Laws of Reflection-Laws of Refraction- Total internal reflection- Lenses-terminology-conjugate points – planes and distances-image tracing-location of the image-sign convention-thin lens-lens equation-lens maker`s equation-power-equivalent focal length of two thin lenses.

UNIT II DISPERSION

Dispersion by a prism-Refraction through a prism-Angular dispersion-Dispersive power-Angular and chromatic dispersions-Achromatic combination of prisms-Deviation without dispersion-dispersion without deviation-Direct vision spectroscope.

UNIT III INTERFERENCE

Coherence – Conditions for interference – Techniques of obtaining interference - Fresnel Biprism – Achromatic fringes – Interferometry – Thin film – Plane parallel film – Interference due to transmitted light – Haidinger fringes – Variable thickness (Wedge-shaped) film – Newton's rings- Michelson's interferometer

UNIT IV DIFFRACTION

Huygen's – Fresnel theory - Zone plate – Distinction between interference and diffraction – fresnel, Fraunhoffer types of diffraction – Diffraction at a circular aperture– diffraction pattern due to a straight edge-Fraunhoffer diffraction at a single slit, circular aperture – Plane diffraction grating

UNIT V POLARIZATION

Polarized light – Production of linearly polarized light – Polarizer and analyzer – Anisotropic crystals – Calcite crystal – Huygens' explanation of double refraction – Phase difference between e-ray and o-ray – Superposition of waves linearly at right angles – Types of polarized light – Effect of polarizer on transmission of polarized light – Retarders or wave plates – Production of elliptically and circularly polarized light – analysis of polarized light – Optical activity – Specific rotation – Laurent's half-shaded polarimeter.

TEXT BOOK:

N. SUBRAHMANYAM, BRIJLAL & M.N. AVADHANULU ; A Text Book Of Optics , S.CHAND,2006(ISBN:81-219-2611-4)

REFERENCE BOOK:

F.A. JENKINS, H.E. WHITE, Fundamentals Of Optics (4^{TH} EDITION) MCGRAW- HILL BOOK COMPANY,1981(ISBN:0-07-032330-5)

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DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:ESP21(M)**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Elective**	**No. of Credits**	**:2**
Title of the paper	**: MATHEMATICAL PHYSICS**		

COURSE OBJECTIVES:

- To discuss in detail the concept of div, curl and gradient.
- To enable the students to understand the concept of eigen vectors and eigen values.
- To enhance the mathematical skill of students by indulging them in problem solving.

UNIT – I VECTOR ANALYSIS AND CURVED COORDINATES

Curvilinear Coordinates – Circular, Cylindrical and Spherical Polar Coordinate system – Gradient, Divergence and Curl in Cylindrical and Polar Coordinates**.**

UNIT – II SPECIAL MATRICES

Diagnol – Triangular – Symmetric and antisymmetric – Orthogonal – Hermitian, Skew Hermitian - Unitary Matrices. Eigen vectors and Eigen Values – Diagnoalisation of Matrices.

TEXT BOOK

Mathematical Physics (II ed.) Gupta, B.D : Vikas Publishing House, 1993, ISBN:0-7069-76-4.

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DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:ESP21(P)**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Elective**	**No. of Credits**	**:2**

Title of the paper : PHYSICS IN EVERYDAY LIFE

COURSE OBJECTIVES:

- To introduce the Physics principles used in many frequently used appliances
- To understand the basic principles involved in many medical diagnostic tools
- To appreciate the physics principles that are used in communication systems

UNIT I: HOME APPLIANCES

Principle and working of electric lights, the electric fan, air cooler and air-conditioning unit - pressure cooker, refrigerator, washing machine, mixie, grinder, rice cooker, microwave oven.

UNIT II: MEDIA

Principles involved in the working of the radio, TV, the remote control- principle and working of the tape recorder-CD player and the DVD player - microphones, amplifiers and loud speakers- the cinema.

TEXT BOOKS :

1. Andrade, Physics for the Modern World, The English Language Book Society.

REFERENCE BOOKS :

1. E. Sedov, Entertaining Electronics, University Publishers.
2. Leslie Cromwell, Biomedical Instrumentation and Measurements, Prentice Hall of India.

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP31**
Semester	**: III**	**No. of Hrs allotted**	**: 6**
Paper	**: Core**	**No. of Credits**	**: 5**

Title of the paper : PROGRAMMING IN 'C'

COURSE OBJECTIVES:

- To introduce to the students ,one of the fastest growing, versatile and much sought after language-C
- To explain the fundamentals of the language in a simple and lucid way.
- To inspire the students to delve into problem solving by the exercises at the end of the chapter

UNIT I INTRODUCTION

Origin of C – Form of C program –Operating system – Character set – C token –C identifiers -Key words – Constants – Data types – Variables – Float –Character – Void -Operators – Different types – Expression – scanf ( ) – printf ( ) functions.

UNIT II CONTROL STATEMENTS

If statement – Various types – Nested Ifs – Looping – Break statement – Continue statement – Exit function- Switch statement – GOTO statement – Arrays – One dimensional – Two dimensional – Multidimensional

UNIT III FUNCTIONS

C function – Return function – Calling a function – Different methods – Nesting functions – Recursion – Functions with arrays – Storage class - Modifiers – Different specifiers – Character declaration – Reading of strings – Writing strings – String handling functions – Array of strings

UNIT IV POINTERS AND STRUCTURE

Pointers – Pointers use in arithmetic operator – Pointers and arrays – Pointers And arrays – Pointers and character strings – Structures – Initialization – Arrays and structures – Nested structures – Structures and functions – Structure and pointers – Comparison of structure variable – Unions – Bitfield – Typedef – Enumerated data type.

UNIT V FILES & OPERATION

Preprocessor - # define – File inclusion – Operation – fopen – fclose – I/O Operations on files – Random file – Command line arguments – Low level Copy.

CASE STUDIES

1. Program to print first 100 prime numbers
2. Program to find arithmetic & standard deviations
3. Program to find Inverse of a matrix
4. Program to solve simultaneous equations
5. Program to find A.M.,G.M.,& H.M. of given 'n' numbers
6. Program to find factorial by recursion technique
7. Program to find and replace a string
8. Program to add 2 X 2 matrices by using pointer method
9. Program to print max. marks in each subject along with name of students by using structure method
10. Programs to illustrate the use of fprintf ( ) & fscanf ( )
11. Program for Random file organization
12. Program to implement command line arguments

TEXT BOOK:

Programming in C, *Dr.S.RAMASAMY, P. RADHAGANESAN*, Scitech Publications

[Unit I : Sec. 1.1, 1.3, 1.4, 2.1 -2.12, 3.1 -3.3 ; Unit II : Sec. 4.1 -4.16 ,5.1, 5.2, 5.4, 5.7 ; Unit III: Sec. 6.1 – 6.8; Unit IV : Sec.7.1 – 7.6, 8.1, 8.7 – 8.9, 10.1, 10.2 – 10.4, 10.7 – 10.13; Unit V: Sec. 9.1, 9.2, 9.9, 11.1 – 11.13]

REFERENCE BOOKS:

1. E. BALAGURUSAMY, *Programming in ANSIC* (2nd Ed.), TMH Publications.
2. D. Ravichandran, *Programming in C*, New Age International Publications.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : UG **Code : NME 1(P)**
Semester : III **No. of hrs. allotted : 2**
Paper : Non Major Elective I **No. of credits : 2**

NON-DESTRUCTIVE TESTING-I

Course Objectives:

- To explain the basic principles of ultrasonics
- To provide a basic knowledge about non-destructive testing of materials

UNIT – I ULTRASONICS

Classification of sound waves – Ultrasonic waves- Different modes of Ultrasonic waves- Characteristic properties of Ultrasonic waves- Attenuation of Ultrasonic waves- Production of Ultrasonic waves- Magnetostriction Method – Piezo-electric method- Application of Ultrasonic-industrial and Medical.

UNIT – II ULTRASONIC INSPECTION METHOD

Direct method- Pulse echo method- Through transmission method- Time of Flight Diffraction method- Ultrasonic Flaw Detector- Data presentation A, B and C Scan displaystandards and codes.

REFERENCE BOOKS:

1. Baldev Raj, V.Rajendran, P. Palanichamy Science and Technology of Ultrasonics, Narosa Publishing house, 2004
2. Baldevraj, Jeyakumar.T, Thavasimuthu.M, Practical Non- Destructive Testing, (3rd ed.) Narosa Publishing house, 2007.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP41**
Semester	**: IV**	**No. of Hrs allotted**	**: 6**
Paper	**: Core**	**No. of Credits**	**: 5**

Title of the paper : ELECTRICITY AND MAGNETISM

COURSE OBJECTIVES:

- To introduce to the students the basics of electricity and magnetism.
- To enhance the application skills by relating the phenomena of electricity and magnetism with daily activities.
- To inculcate in the students an aesthetic sense towards scientific happenings.

UNIT I: GAUSS'S LAW AND ITS APPLICATIONS

Flux of the electric field – Gauss's law – Differential form of Gauss's law –Applications of Gauss's law –an insulated conductor- Electric field due to a Uniformly charged sphere – an isolated uniformly charged conducting sphere – Uniform Infinite cylindrical charge – an infinite plane sheet of charge – two parallel sheets of charge – Coulomb's theorem.

UNIT II: ELECTRIC POTENTIAL

Electric Potential – Relation between Electric field and Electric potential – Potential at a point due to a uniformly charged conducting sphere – due to a uniformly charged non conducting solid sphere – Potential and field due to an electric dipole – Electric Potential Energy . CAPACITANCE AND CAPACITORS Introduction – Capacitance of a Spherical Capacitor - Outer Sphere Earthed – Inner

Sphere Earthed – Cylindrical Capacitor – Parallel plate Capacitor – Effect of a Dielectric – Capacitors in Series and Parallel –Energy stored in a charged capacitor – Types of Capacitors.

UNIT III: CURRENT ELECTRICITY

Current and Expression for current density – Equations of Continuity – Ohm's law and Electrical Conductivity – Drude –Lorentz theory of electrical cionduction-Kirchhoff's laws – Applications of Kirchhoff's laws to Wheatstone's network.

TRANSIENT CURRENTS

Growth of a current in a circuit containing a resistance and inductance – Decay of current in a circuit containing L and R – Charge and Discharge of a Capacitor through R – Measurement of High resistance by leakage – Growth of charge in LCR Circuit – Decay of charge in LCR circuit.

ALTERNATING CURRENTS

EMF induced in a coil rotating in a magnetic field – Peak, average and RMS values of Voltage and current – Series and Parallel resonant circuits – Power in an A.C. circuit – Wattless current – Choke coil – The transformer.

UNIT IV: MAGNETIC PROPERTIES OF MATERIALS

Magnetic induction – magnetization – Relation between the three magnetic vectors - Susceptibility, permeability – Properties of Dia, Para, Ferro magnetic materials – The Electron theory of Magnetism – Langevin's theory of Dia, Para magnetism – Weiss theory of Ferro Magnetism – Experiment to draw B-H Curve – Energy loss due to Hysteresis.

UNIT V: MAGNETOSTATICS

Magnetic vector potential – Magnetic field for a long straight current carrying wire – magnetic scalar potential – application of magnetic scalar potential: Equivalence of a small current loop and a magnetic dipole – Electric field vector in terms of scalar and vector potentials – Magnetic shell – Potential at any point due to a magnetic shell – Magnetic potential and field at a point on the axis of a flat circular magnetic shell – Equivalence of magnetic shell and current circuit – The Hall effect.

TEXT BOOK:

R.MURUGESHAN, *Electricity and Magnetism*, (Nineth revised edition.), S.Chand & Company Ltd, New Delhi, 2011.[ISBN:81-219-1705-0]

(Unit I Sec. 2.1 –2.6, 2.8- 2.11, Unit II Sec. 3.1 – 3.8, 4.1 – 4.6, 4.8, 4.9, 4.13, Unit III Sec. 6.1-6.6, 12.1-12.6, 13.1-13.7,Unit IV Sec. 15.1-15.13, 15.15, 15.16, Unit V Sec 22.1-22.10)

REFERENCE BOOK:

1. A.F. KIP, *Fundamentals of Electricity and Magnetism* (2nd ed.), McGraw-Hill, New York, 1969.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:ESP41(M)**
Semester	**: IV**	**No. of Hrs allotted: 2**	
Paper	**: Skill Based Elective**	**No. of Credits**	**: 2**

Title of the paper: MEDICAL PHYSICS-I

COURSE OBJECTIVES:

- To introduce to the students the various medical equipments and the physics behind, their working.
- To provide a basic idea about X-Rays and the hazards of radiation on human health.
- To help the students appreciate the physical processes involved in the working of the equipments.

UNIT I

Thermal expansion – clinical thermometer – Thermostats – Use in Incubators – elementary idea of gas pressure – Blood pressure measuring apparatus – Physics of hearing – working of hearing aid – Effect of Infra & Ultra sound effect.

UNIT II

Transducers – definition –Transducers for Bio medical applications – Biological transducers – Bio medical transducers.- Doppler effect & Ultrasonics – Doppler Ultra sonography – Scanning – working of CT Scan – working of Betatron – Its medical applications –X – Rays – (Production & properties) – Soft & Hard X – Rays in medical diagnostics – Physiological consequences of nuclear radiations – Radiation therapy – Radiation diagnostics – Nuclear cardiogram.

REFERENCE BOOKS:

1. How thinks work Vol. 1 & Vol. 2 :Harpens Collins Publ. India. A joint venture with The India Today Group, New Delhi (2002).
2. A text book of bio physics : R.N.Roy, Books and Allied (P) Ltd. (2001).
3. Bio medical Instrumentation : M.Arumugam
4. Optics : Brijlal & Subramaniam S. Chand & Co (2002).
5. Bio medical electronics & Instrumentation : Prof.S.K.Venkatraman Galgotia Pub. Pvt. Ltd, 2002.
6. Bio medical Instrumentation & : Leslie Cromwell, Fred.J.Weibell and Measurements Erich A. Pfeiffer PHI (2002).

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No. :ESP41(P)**
Semester	**: IV**	**No. of Hrs allotted : 2**
Paper	**: Skill Based Elective**	**No. of Credits : 2**

Title of the paper: PRACTICAL ELECTRIC CIRCUITS - I

COURSE OBJECTIVES:

- To explain to the students the steps involved in power transmission.
- To discuss in detail the internal circuitry of various electrical instruments and the methods of troubleshooting.
- To inculcate in the students a scientific temper and to make them realize the importance of electric power.

UNIT I

Magnetic effect of electric current – (Qualitatively) – self-inductance & mutual inductance – Design of a coil – transformer – Design of a step down transformer for a required parameter constructing a power supply for radio and tape recorder –electrical measuring instruments – galvanometer – ammeter –voltmeter – wattmeter – multimeter – fault finding in electrical measuring instruments.

UNIT II

Working of an accumulator – short circuit – (fuses) – switches – generators –(dynamo) – water pumps(piston, centrifugal and diaphragm pumps, refrigerators – air conditioners – microphones – tape recorders – loud speakers –incandescent and fluorescent lamps.

TEXT BOOKS:

1. Electricity & Magnetism : Brijlal & Subramaniam, S. Chand & Co. (2002).
2. Electrical technology : Theraja S. Chand & Co. (2002).
3. How things Work Vol 1 & Vol 2: Harper Collins Publ. India a joint venture with The India Today Group, N. Delhi, (2002).

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course: UG **Code : NME 2(P)**

Semester: IV **No. of hrs. allotted : 2**

Paper : Non-Major Elective II **No. of credits : 2**

NON – DESTRUCTIVE TESTING-II

UNIT – I LIQUID PENETRANT TEST

Physical Principles – Procedure for Penetrant testing - Penetrant testing materials - Penetrant test methods – Water washable method – Post emulsifiable Method – Solvent removal method – Application and limitations.

UNIT – II RADIOGRAPHY

Basic Principle – X-ray source generation and properties – radiation attenuation in the specimen – Radiograpic imaging – Geometrical factors – Radiographic films – Penetrameters – Inspection technique – Single wall single image- Double wall penetration technique.

REFERENCE BOOK:

Baldevraj, Jeyakumar.T, Thavasimuthu.M, Practical Non- Destructive Testing, (3rd ed.) Narosa Publishing house, 2007.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :MP51**
Semester : V **No. of Hrs allotted : 4**
Paper : Core **No. of Credits : 4**
Title of the paper: ELEMENTARY SOLID STATE PHYSICS

COURSE OBJECTIVES:

- To initiate the beginners into the fascinating subject of solid state physics.
- To provide an insight into the electronic structure of solids especially metals semiconductors and dielectrics.
- To deal extensively on newer topics on superconductivity, magnetic properties of materials and the physics of semiconductors

UNIT I CRYSTAL PHYSICS – I

Crystal Physics Lattice Points and Space Lattice – The Basis and Crystal Structure – Unit cells and Lattice parameters – Unit Cells versus Primitive cells – Crystal Systems – Crystal symmetry – Twenty three Symmetry elements in a Cubic Crystal – Fivefold rotation axis is not compatible with a Lattice – Combination of Symmetry elements – Rotation-Inversion axis – Translation symmetry Elements – Space Groups – The Bravais Space Lattices – Metallic Crystal Structures – Relation Between the Density of Crystal Material and Lattice constant in a Cubic Lattice.

UNIT II CRYSTAL PHYSICS – II

Other Cubic Structures Directions, Planes and Miller Indices – Important Features of Miller indices of Crystal Planes – Important planes and Directions in a Cubic crystal – Distribution of Atoms in the Atomic Planes of a Simple Cubic Crystal – Separation Between Lattice planes in a Cubic crystal – Allotrophy and Polymorphism – Imperfections in Crystals – Reciprocal Lattice.

Wave Nature of Matter and X-ray Diffraction The de Broglie Hypothesis – Relativistic Correction – experimental Study of Matter Waves – The Davisson-Germer Experiment – Heissenberg's Uncertainity Principle – X-ray Diffraction – Bragg's Law – Bragg's X-ray Spectrometer – Powder Crystal Method – Rotating Crystal Method – Correction for Bragg's Equation.

UNIT III SUPERCONDUCTIVITY

A survey of superconductivity – Mechanism of super conductors – Effects of magnetic field A.C. Resistivity – Critical currents – Flux exclusion – The meissner effect – Thermal properties – The Energy Gap – Isotpe Effect – Mechanical Effects – The Penetration Depth – Type I and Type II Superconductors – London equations – Electrodynamics – superconductors in A.C. Fields – B.C.S. Theory – Josephson's Tunneling – Theory of D.C. Josephson Effect .

UNIT IV FRACTURES, OXIDATION AND CORROSION

Fractures in materials – Ductile fracture – Brittle fracture – Fracture toughness – The ductile-brittle transition – Methods of protection against fracture – Fatigue fracture – Oxidation and Corrosion – Mechanisms of oxidation – Oxidation resistant materials – The principles of corrosion – Protection against corrosion.

UNIT V MAGNETIC AND DIELECTRIC MATERIALS

Terminology and Classification – Magnetic moments due to electron spin – Ferromagnetism and related phenomena – The domain structure – The hysteresis loop – Soft magnetic materials – Hard magnetic materials – Polarization – Temperature and frequency effects – Electric breakdown – Ferroelectric materials.

TEXT BOOKS:

1. S.O. PILLAI, *Solid State Physics* – (4th Ed.), New Age International Publisher,

   1997, (ISBN:81-224-1048-0).(Unit I : Pages 87 – 109; Unit II : Pages 110 -145, 157 – 170 ;

   Unit III : Pages 359 ,361 – 381 , 387 -389,392 -394)

2. V. RAGHAVAN, *Materials Science and Engineering – A First Course* (4th Ed.),
   Prentice-Hall of India, 2003 (ISBN:81-203-1261-9)
   (UNIT IV Sections 12.1 -12.6 , 13.1 -13.4)
   UNIT V Sections 16.1 – 16.7 , 17.1 -17.4)

REFERENCE BOOKS:

1. N.B. HANNAY, *Solid State Chemistry*, Prentice Hall of India Private Limited, 1976.
2. N. ARUMUGAM, *Materials Science* (3rd Ed.), Anuradha Agencies, 2002.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP52**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Core**	**No. of Credits**	**: 4**

Title of the paper : ANALOG ELECTRONICS

COURSE OBJECTIVE

- To provide the fundamental aspects regarding the design of analog electronic circuits for various applications.

UNIT I SEMICONDUCTOR DIODES AND HYBRID PARAMETERS

Semiconductor diode- crystal diode- rectifiers-half and full –wave rectifiers-bridge rectifier-efficiency-ripple factor- filter circuits-Zener diode-crystal diode versus vacuum diode-hybrid parameters- determination of h parameters-transistor circuit performance in h parameters-experimental determination of h parameters-limitations of h parameters.

UNIT II TRANSISTOR AND TRANSISTOR BIASING

Transistor action-CB, CE & CC modes-comparison-amplifier in CE arrangement-load line analysis-cut-off and saturation-power rating-application of CB amplifier-faithful amplification-transistor biasing-various methods of transistor biasing: base resistor, feedback resistor, voltage divider methods-instantaneous current and voltage wave forms.

UNIT III TRANSISTOR VOLTAGE AMPLIFIERS

Single stage amplifier-graphical demonstration-practical circuit-phase reversal-DC & AC equivalent circuits-load line analysis-voltage gain- input impedance of CE amplifier-classification of amplifiers-multistage transistor amplifier-important terms - RC, transformer and direct coupled amplifiers.

UNIT IV TRANSISTOR AUDIO POWER AMPLIFIERS

Transistor audio power amplifier-small signal and large signal amplifiers-difference between voltage and power amplifiers-performance quantities and classification of power amplifiers-expression for collector efficiency-maximum collector efficiency of series-fed class A amplifier-thermal runaway- heat sink-push-pull amplifier.

FEEDBACK IN AMPLIFIERS

Feedback-principles of negative voltage feedback-gain of negative voltage feedback amplifier-advantages of negative voltage feedback - principles of negative current feedback- current gain

UNIT V OSCILLATORS

Sinusoidal oscillator and its types-oscillatory circuit-positive feedback amplifier-essentials of transistor oscillator-explanation of Barkhausen criterion - tuned collector, Colpitt's, Hartley, and phase shift oscillators.

MODULATION AND DEMODULATION

Modulation-types of modulation-amplitude modulation-modulation factor- sideband frequencies in AM wave- transistor AM modulator-limitations of amplitude modulation-frequency modulation-theory of FM-comparison of FM and AM- demodulation

TEXT BOOK

1. V. K. Mehta, R. Mehta, Principles of electronics, 11th ed., S. Chand & Co., New Delhi.

REFERENCE BOOKS

1. D. A. Bell, Electronic devices and circuits, 4th ed., Prentice-Hall of India, New Delhi.
2. A. Malvino, D. J. Bates, Electronic principles, 7th ed., Tata McGraw-hill publishing Co. Ltd., New Delhi.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP53**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Core**	**No. of Credits**	**: 4**
Title of the paper	**: MODERN PHYSICS**		

COURSE OBJECTIVES:

- To develop in the students a sense of critical appreciation of the theory of relativity.
- To help students differentiate between the atomic theory and nuclear physics.
- To impart to the students the know hows of radioactivity and the pros and cons behind it.

UNIT I: SPECIAL THEORY OF RELATIVITY

Galilean transformations – Electromagnetism and Galilean transformations – Michelson Morley experiment – Postulates of special theory of relativity – Lorentz transformations – Velocity transformation – Length contraction – Time dilation – Simultaneity – Relativistic mass – Mass and Energy – Space-Time diagrams – General relativity.

UNIT II: ATOMIC PHYSICS

Hydrogen atom spectrum – Orbital magnetic moment of hydrogen atom – Larmor precession – Stern-Gerlach experiment – Electron spin – The vector atom model – Spin-Orbit interaction and fine structure – Pauli's exclusion principle and electronic configuration – Total angular momentum in many electron atoms – Normal Zeeman effect – Anomalous Zeeman effect – Paschen-Bach effect – Stark effect.

UNIT III: NUCLEAR PROPERTIES AND NUCLEAR REACTIONS

Constituents of nuclei – Nuclear size – Mass spectrometer - Binding energy – Angular momentum of the nucleus – magnetic moment – Nuclear quadrupole moment – Parity – General features of Nuclear forces – Nuclear reactions – Nuclear reaction kinetics – Reaction mechanisms – Nuclear Fission – Fission reactor – Nuclear fusion – Transuranium elements

UNIT IV: RADIOACTIVE DECAY

Discovery of radioactivity – Rate of decay, half-life and mean life – Conservation laws in radioactive decays – Decay series – Radioactive equilibrium – Radioactive dating – Alpha decay – Beta decay – Gamma decay – Radioisotopes

UNIT V: DETECTORS AND ACCELERATORS AND ELEMENTARY PARTICLES

Geiger-Muller Counter – Scintillation Counter – The Cloud Chamber – The Bubble Chamber – Cyclotron – Synchrotron – Linear Accelerator - Fundamental interactions in nature-Dawn of elementary particle physics-particles and anti particles-classification of elementary particles-conservation laws.

TEXT BOOK:

Modern Physics, G. Aruldhas and P. Rajagopal, PHI Learning Private Limited, 2006.

Unit I	Chapter 1, pp.1-25
Unit II	Chapter 7, Secs.7.1-7.9; 7.13-7.16
Unit III	Chapter 17, Secs.17.1-17.8 and 17.12 and Chapter 19
Unit IV	Chapter 18
Unit V	Chapter 20, Secs.20.1, 20.2, 20.4, 20.5, 20.7-20.9.
	Chapter 21, Secs.21.1-21.4

BOOKS FOR REFERENCE :

1. Modern Physics-N.K.Sehgal,K.L.Chopra&D.L.Sehgal (9^{th} edition)S.Chand&sons ,2004 (ISBN:81-8054-261-0)
2. Perspectives of Modern Physics -A.Beiser, ,Mc Graw Hill Co.
3. Concepts of Modern Physics – BEISER,6^{th} edition(ISBN:007-123460-8).
4. Modern Physics-R.Murugesan & Kruthiga Sivaprasath

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :EMP51 (E)**
Semester : V **No. of Hrs allotted : 4**
Paper : Core Elective **No. of Credits : 3**
Title of the paper : EXPERIMENTAL DESIGN

COURSE OBJECTIVES:

- To know about the error analysis in measurement.
- To get the knowledge about various types of instruments and their design.
- To aware of radiation safety while in measurement.

UNIT I: PHYSICAL MEASUREMENT

Measurement-result of a measurement-sources of uncertainty and experimental error-systematic error-random error-definition of uncertainty-analysis of repeated measurements-mathematical description of data distribution functions-derivation and properties of distribution functions-propagation error-analysis of data-multiparameter experiments.

UNIT II: INSTRUMENTATION AND SYSTEM DESIGN

Experiment design-transducers-transducer characteristics-selection of an instrumentation transducer-transducer as an electrical element-modeling external circuit components-circuit calculations-instrument probes-power measurements-measurement methods-DC and AC bridge measurements.

UNIT III: TRANSDUCER PROPERTIES

Temperature measurements –definition of temperature –temperature transducers-thermal radiation temperature measurements-low temperature thermometry-optical measurements and the electromagnetic spectrum-linear position sensors-summary and conclusions.

UNIT IV: OPTICAL INSTRUMENTS

Spectroscopic instruments-visible and infra red spectroscopy-spectrometer design-refraction and diffraction –lenses and refractive optics-dispersive elements-spectrometer design-Lasers –Fibre optics.

UNIT V: RADIATION DETECTION,MEASUREMENT AND SAFETY

General principles of radiation detection –types of radiation detectors-radiation dose-occupational health and safety-chemical substances –radiation safety.

TEXT BOOK:

Measurement,Instrumentation and experiment design in physics and engineering,Sayer,M. &Mansingh,A. PHI,2005,ISBN:81-203-1269-4.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:EMP51 (QM)**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Core Elective**	**No. of Credits**	**: 3**
Title of the paper	**: ELEMENTARY QUANTUM MECHANICS**		

COURSE OBJECTIVES:

- To introduce to the students the basic concepts of Quantum mechanics
- To help students compare and contrast Newton's classical mechanics and Planck's QM

UNIT–I ORIGIN OF QUANTUM THEORY

Black body radiation-Failure of classical physics to explain energy distribution in the spectrum of a black body – Planck`s quantum theory – Photoelectric effect – Einstein`s explanation of the photoelectric effect – The Ritz combination principle in spectra – Stability of an atom – Bohr`s quantization of angular momentum and its application to the hydrogen atom.

UNIT-II WAVE PROPERTIES OF MATTER

Wave particle duality – de Broglie hypothesis for matter waves – concept of wave velocity – Concept of Group velocity – Velocity of de Broglie wave –diffraction of particles – Interference of electrons – Consequences of de Broglie`s concepts –wave packet.

UNIT-III HEISSENBERG`S UNCERTAINTY PRINCIPLE

Uncertainty principle – Elementary proof of Heisenberg`s uncertainty relation - Elementary proof of uncertainty relation between energy and time – Illustration of Heisenberg`s uncertainty principle by thought – Experiments – Consequences of uncertainty relation.

UNIT-IV SCHRODINGER`S WAVE EQUATION

Schrodinger`s one dimensional time dependent wave equation- one dimensional time independent Schrodinger`s wave equation – Physical interpretation of the wave function Ψ - Operators in quantum mechanics, Eigen function , Eigen value and Eigen value equation – Expectation values – Postulates of quantum mechanics – transition probability.

UNIT–V APPLICATIONS OF QUANTUM MECHANICS

Particle in a one dimensional box – Particle in a rectangular three dimensional box – Simple Harmonic Oscillator – Reflection at a step potential – Transmission across a potential barrier : the Tunnel effect.

TEXT BOOK:

Elements of Quantum Mechanics, *Kamal Singh , S.P. Singh:* S. Chand & Company, 2005

ISBN:81 -219-2539-8

UNIT I Chapter 1 [Sec. 1.1 – 1.8]
UNIT II Chapter 2 [Sec. 2.1 – 2.9]
UNIT III Chapter 3 [Sec. 3.1 – 3.5]
UNIT IV Chapter 4 **[**Sec. 4.1 – 4.7]
UNIT V Chapter 5 [Sec.5.1 – 5.5]

REFERENCE BOOK:

Quantum Mechanics, *Aruldhas, J.*:, Prentice – Hall of India, 2002, ISBN81- 203-1962.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc. Physics **Code :MPSS**
Semester : V **No. of hrs. allotted :**
Paper : Self-study **No. of credits : 5***

VISUAL ASTRONOMY

Course Objectives :

- To popularise Astronomy as a healthy hobby among students of all disciplines
- To identify the summer and winter constellations and record preliminary data on the movement of stars and planets
- To appreciate the night sky and understand the celestial phenomena with the help of naked eye observations

UNIT – I INTRODUCTION TO THE SKY

Star names – Astronomical Catalogues – Understanding Magnitudes – Seeing colour in the sky – Dark adaptation – Averted versus direct vision – Finding your way around the Sky – Apparent sizes and distances – Astronomical distances – Time in astronomy- How dark is your sky ? – Part under the Stars.

UNIT – II CHOOSING THE RIGHT EQUIPMENT AND VIEWING THE NAKED EYE SKY

Naked eye, Binocular or a telescope? - Binoculars – Types of telescope – Trick the light fantastics – Telescope mounts – Eye Pieces - Filters – Other accessories – Atmospheric effects on sun light – Sunrise & Sunsets – Conjunctions –Constellations and Asterisms – Auroral lights – meteors and fire

balls – Treats of the zodiacs – The Milky way.

UNIT – III EXPLORE THE WINTER, SPRING SKIES

Learn the winter Constellation – Discovers the jewels in Taurus – Survey the wonders in orion – View the gems in Gemini – learn the Spring Constellation – View the Marvels in Leo – Scan the delights in Ursa Major – Go galaxy – Hunting in Virgo.

UNIT – IV EXPLORE THE SUMMER AND SKIES

Learn the Summer Constellation – Spy the glittering clusters in Scorpius – Encounter the Milkyway in Saggitarius – Survey bright gas clouds in Cygnus - Learn the Autumn Constellation – Detect a kings fortune in Cebheus – Observe Milkyway riches in Cassiopeia - Spot a grand galaxy in Andromeda

UNIT – V RECORD THE SKY

Sketch the Sky – Photograph the Sky – The 88 Constellations – The 25 Brightest star.

TEXT BOOK

Talcott, R.: Teach yourself visually astronomy, Wiley Publishing, New Jersey, 2009.

BOOKS FOR REFERENCE

Bely, P.Y, Christian, C.& Roy, J. R. : A question and answer guide to astronomy, Cambridge University Press, New York, 2010.

Software aid: www.stellarium.org

***-Extra credits**

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :MP61**

Semester : VI **No. of Hrs allotted : 4**

Paper : Core **No. of Credits : 4**

Title of the paper : MOLECULAR SPECTROSCOPY

COURSE OBJECTIVES

- To provide an overview of the principles of rotation, vibration and symmetry of molecules.
- To expose the students to the principles of IR, FTIR, Raman, NMR, ESR and Laser spectroscopic methods
- To distinguish between the various spectroscopic techniques, their principles, applications advantages and disadvantages.

UNIT – I FUNDAMENTALS OF SPECTROSCOPY

Electromagnetic spectrum - Types of molecular energies – Different spectroscopic methods - Spectral line width – Absorption and emission of radiation – Einstein's coefficients –Molecular Symmetry: Symmetry operations – Symmetry elements.

UNIT – II ROTATION OF MOLECULES

Classification of molecules – Interaction of radiation with rotating molecule – Rotational spectra of rigid diatomic molecules - Isotope effect in rotational spectra – Intensity of rotational lines – Nonrigid rotator – Vibrational excitation effect – Linear polyatomic molecules – Symmetric top molecules – Asymmetric top molecules – microwave spectrometer-information derived from rotational spectra.

UNIT – III INFRARED SPECTROSCOPY

Vibrational energy of diatomic molecule – Infrared selection rules- vibrating diatomic molecule – Diatomic vibrating rotator – Vibrations of polyatomic moleculesrotation vibration spectra of polyatomic molecules – IR spectrophotometer – Sample handling techniques – Fourier transform infrared spectroscopy – Applications.

UNIT – IV RAMAN SCATTERING AND NUCLEAR MAGNETIC RESONANCE

Theory of Raman scattering – rotational Raman spectra – Vibrational Raman Spectra – Mutual exclusion principle - Raman spectrometer – sample handling techniques – Magnetic properties of nuclei – Resonance condition – NMR instrumentation – Additional experimentation techniques – Relaxation processes – Chemical Shift - NMR imaging.

UNIT – V ELECTRON SPIN RESONANCE AND LASER SPECTROSCOPY

Introduction- Principle of ESR – ESR Spectrometer - Nonlinear optical effects – frequency generation by nonlinear optical techniques – sources of Laser spectroscopy – Supersonic beams and jet cooling – Hyper Raman effect – Stimulated Raman scattering – Inverse Raman scattering – Coherent anti-stoke's Raman scattering – Photoacoustic Raman scattering – Circular dichroism spectroscopy

TEXT BOOK

Aruldhas, G. : *Molecular Spectroscopy*, PHI Learning Private Limited, New Delhi, 2009.

Unit I- Chapter1 (1.1-1.6) Chapter 5(5.1,5.2)

Unit II-Chapter 6 (6.1-6.10,6.14,6.15)

Unit III- Chapter 7 (7.1-7.5, 7.7, 7.16-7.19)

Unit IV- Chapter 8 (8.2-8.7), Chapter 10 (10.1-10.5, 10.8, 10.19)

Unit V- Chapter 11(11.1-11.3), Chapter 15(15.1-15.9,15.16)

BOOKS FOR REFERENCE

1. Graybeal, J.D. : *Molecular spectroscopy*, Mc Graw-Hill, New York, 1988.
2. Hollas, M: *Modern spectroscopy*, 4th ed., John Wiley, New York, 2004.
3. Randhwa, H.S.: *Modern Molecular spectroscopy*, Macmillan, New Delhi, 2003.
4. Straughn, R.P. and walker, S., *Spectroscopy, Vols.I, II & III*, Chapman and Hall, London,1976.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: MP62**
Semester	**: VI**	**No. of Hrs allotted: 4**	
Paper	**: Core**	**No. of Credits**	**: 4**

Title of the paper: INDUSTRIAL PHYSICS

COURSE OBJECTIVES

- To provide deep knowledge about IC's, Diodes and FET.
- To enable the students to know about the theory, concepts and applications of measuring devices.

UNIT I: DIODES

Zener diode –Schottky diode-PIN diode –LED -7 segment display-Photo diode-Field Effect Transistor-Introduction –Junction Field Effect Transistor-Operation of JFET –Characteristics-Drain Characteristics –Transfer Characteristics –JFET parameters-MOSFETs-Depletion type MOSFET-working of a depletion type MOSFET- Drain Characteristics –Transfer Characteristics

UNIT II: INTEGRATED CIRCUITS AND REGULATORS

Integrated circuit-advantages of IC`s –limitations of IC`s –Scale of Integration –Classification of IC`s –Monolithic IC`s –Thick and thin film IC`s-comparison among different IC`s –Linear IC`s –Non linear IC`s –IC terminology-Fabrication of monolithic IC`s –Fabrication : IC components – Bipolar transistors- FET`s –JFET`s –Diodes-Resistors-Capacitors. Voltage Regulators-various types-Uses of Zener diode as regulator-Disadvantages –Uses of transistor as voltage regulators-short circuit protection-Three pin IC regulators-adjustable voltage regulator.

UNIT III: FET AMPLIFIERS

Introduction-biasing the FET and JFET-Gate Bias-Self Bias-Setting a Q-point –Setting a Q-point using DC load line-Voltage divider bias-Source Bias-Current source bias- Biasing Depletion type MOSFET`s-Small signal: FET models- Low frequency FET models-high frequency FET model-FET amplifier-Common source Amplifier-analysis- common drain amplifier-analysis-common gate amplifier –analysis.

UNIT IV: CONVERTERS AND INVERTERS

Inverters – Introduction – working principle – Choppers – DC Chopper – Single thyristor chopper – Dual Converters – Single Phase converter – Three Phase converter – Cyclo converters – Introduction and types of cyclo converters – Photo electric devices – Introduction – LDR– photovoltaic cells – Photo conductive cells – Transducers – Introduction – classification – Transducers in instrumentation and control systems – selection of transducers – Types of transducers.

UNIT V: BRIDGES

Wheatstone bridge – Kelvin bridge –AC bridges-Maxwell-Hay –Scherring bridges-Unbalance conditions-Wein Bridge

TEXT BOOKS:

1. R.S.SEDHA, A Textbook on Applied Electronics, S.Chand & Co.,
   [Unit I, P 195 – 199, 204-205, 207-214, 248 – 262, Unit II P 285 – 300, 327 – 345, Unit III P538 - 563]
2. S.K.Bhattacharya& S.Chatterjee, Industrial Electronics and Control, Tata-McGraw Hill, Ltd.[Unit IV, P 216 – 218, 234 – 239, 245 – 248, 250 – 252, 416 – 422, 425 – 427, 438 – 445]
3. Helfrick & Cooper, Modern Electronic Instrumentation and Measuring Techniques, Prentice Hall of India,[Unit V, P 101 – 109, 114 – 127]

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:MP63**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Core**	**No. of Credits**	**: 4**

Title of the paper : DIGITAL PRINCIPLES AND APPLICATIONS

COURSE OBJECTIVE:

- To impart to the students the basic principles, theory and working of fundamental digital circuits which form the basis of modern communication systems.

UNIT I DIGITAL PRINCIPLES & DIGITAL LOGIC

Definition of Digital Signals – Digital Wave forms – Digital Logic – Moving & Storing – Digital Information – Digital operation- Digital Components – Digital ICs – Digital IC signal levels - Binary – Basic Gates – Boolean Algebra – Gates with bubbles – Positive & Negative Logic.

UNIT II COMBINATIONAL LOGIC CIRCUIT & DATA PROCESSING CIRCUIT

Boolean Laws – Sum Of Products – Truth Table to Karnaugh Map - Karnaugh Map Simplification – Product Of Sum – Multiplexer – Decoder – Encoder – XOR Gates – Parity Generator – ROM - PAL – PLA – Trouble Shooting.

UNIT III FLIP FLOPS, CLOCKS & TIMERS

RS Flip Flop – Edge Triggered RS, D, JK Flip Flops – Flip Flop Timing – JK Master Slave – Switch Contact Bouncing Circuit – Clock Wave forms – TTL Clock – Schmidt Trigger – Circuits using 555 timer – Pulse forming Circuits.

UNIT IV REGISTERS & COUNTERS

Types of Registers – SISO – SIPO – PISO – PIPO – Ring Counter – Various types of Counters - Asynchronous, Synchronous, MOD – 5, Presettable, & Shift Counters – MOD 10 shift counter – Digital Clock.

UNIT V ARITHMETIC CIRCUITS, D/A & A/D CONVERSION

Binary Addition – Subtraction – Unsigned Binary Numbers – 2's compliment – Arithmetic building block – Adder – Subtractor – Binary Multiplication & Division – Variables Resistor Networks – Binary Ladder – DAC – ADC – AD technique – Dual Slope – AD Accuracy & Resolution.

TEXT BOOK :

DONALD P. LEECH and ALBERT PAUL MALVINO, *Digital Principles and Applications* (5th Ed.), MALVINO, Tata-McGraw-Hill.

REFERENCE BOOK:

1. Experiments in Digital Principles by Donald P. Leach, III Edition, Tata McGraw Hill.
2. Digital Fundamentals by Flyod, Universal Books Stall, New Delhi.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**:EMP61 (A)**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Core Elective**	**No. of Credits**	**: 3**
Title of the paper	**: APPLIED ELECTRONICS**		

COURSE OBJECTIVES:

- To enhance the application skills of the students by providing working knowledge of various electrical instruments.
- To provide an introduction to the basic concepts of microprocessors.
- To give first hand knowledge about the various electrical appliances used at home and hence to develop their scientific attitude.

UNIT I

Testing of instruments Galvanometer – Conversion of galvanometer into an ammeter, voltmeter and ohmmeter – Multimeter – CRO – Construction and Basic operation – CRO for measurements – Display and analysis – VTVM .

UNIT II

Electrical switches Switches – Fuses – Circuit breaker – Electromagnetic Relay – Principle and operation of SCR, UJT, DIAC, TRIAC – SCR as control devices

UNIT III

Electrical appliances Electric fans – Refrigerators – Air conditioner – Washing machine – Tape recorder – General principles and working

UNIT IV

Television Fascimile – Transmission – Receiption – Television – T.V. Channels –Interlaced Scanning (Simple idea only) – broadcasting – Interlaced scanning – VSB Transmission of T.V.signal –Image Orthicon – Vidicon – T.V. Transmission – Monochrome T.V. Receiver – Principle of Colour T.V. – PAL Colour receiver – Picture Tube

UNIT V

Microprocessor and microcomputer LSI chip – CPU – Instruction register – Decoders – ALU control and timing circuits – Address bus, Data bus and control bus – Basic idea of operating systems – An example – special purpose of microcomputers – (Block diagram)

TEXT BOOKS:

1. Principles of Electronics, V.K. Mehta, S.Chand & Co., ISBN 81-219-0002-6 [Unit I- Pg. 442-459]
2. A text book of Applied electronics, R.S. Sedha, 2000, S.Chand & Co.,ISBN 81-219-0420-X[Unit –II, Pg.116-122, 267-283]
3. How things work Vol I& Vol II [Unit –III, Pg. 242-245,256-257, 320-323, 402-405]
4. Principles of Communication Engineering, Anokh Singh, S.Chand & Co.,[Unit – IV, Pg 508-514, 516-529]
5. Fundamentals of computer, 2nd Edition, V. Rajaraman, Prentice Hall of India,1996, ISBN-81-203-1003-9 [Unit V- Pg.176-178,192-198,205-207]

REFERENCE BOOKS

1. ELECTRONIC INSTRUMENTATION & MEASUREMENT TECHNIQUES, WILIAM DAVID COOPER – PRENTICE HALL OF INDIA.
2. INDUSTRIAL ELECTRONICS, G.K. MITHAL

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :EMP61 (N)**

Semester : VI **No. of Hrs allotted : 4**

Paper : Core Elective **No. of Credits : 3**

Title of the paper : INTRODUCTION TO NANO SCIENCE

COURSE OBJECTIVES:

- To enable the student understand the postulates and concepts of nanophysics with clarity.
- To help the students understand the principles, fabrication and design of Carbon Nano-Tubes and their application.

UNIT I: INTRODUCTION TO NANO

Introduction – Emergence of Nanotechnology – Bottom-Up and Top-Down Approaches-Challenges in Nanotechnology.

UNIT II: GENERAL METHODS OF PREPARATIONS

Self Assembled Minelayers: Introduction – monolayer on gold – growth process- phase transitions - patterning monolayer - mixed monolayer - SAMS and applications.

Semiconductors Quantum Dots: Introduction – synthesis of quantum dots – electronic structure of nano crystals – quantum dots-core relation of properties with size - uses.

UNIT III: GENERAL CHARACTERIZATION

Experimental methods: Investigating and manipulating materials in nanoscales – introduction - electron microscopes - scanning probe microscopes - optical microscopes for nano science and technology – other kinds of microscopes – XRD - associated techniques.

UNIT VI: NANO SENSORS

Introductions - nano sensors - order from chaos - nano scale organization for sensors – characterization – perception - nano sensors based on optical properties - nano sensors based on quantum size effects - electrochemical sensors- sensors based on physical properties - nano biosensors - smart dust.

UNIT V: CARBON NANOTUBES

Introduction - synthesis and purification – filling of nano tubes – mechanism of growth - electronic structure – transport properties – mechanical properties – physical properties – applications – nano tubes of other materials.

TEXT BOOKS:

1. Huozhong Gao, Nanostructures & Nanomaterials, Imperial College Press (2004).
   Unit I – Chapter 1.
2. Pradeep, T. NANO: The essentials – Undeerstanding Nanoscience and nano technology, Tata McGraw-Hill Pubhilisng Company Ltd. New Delhi (2007).
   Unit I – Chapter 1.
   Unit II – Chaper 5 &7.
   Unit III – Chapetr 2.
   Unit VI – Chapter 12.
   Unit V – Chapter 4.

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course : B.Sc., Physics **Code No. :ESP61(M)**

Semester : VI **No. of Hrs allotted : 2**

Paper : Skill Based Elective **No. of Credits : 2**

Title of the paper : MEDICAL PHYSICS-II

COURSE OBJECTIVES:

- To discuss in detail the working of various medical instruments and to provide practical knowledge regarding the same.
- To create an awareness in the students about the banes and boons of nuclear radiation.
- To help students appreciate the beneficial uses of radiation.

UNIT I (15 HRS)

Types of lenses – Focal length – Combination of lenses – Power (Diopter) of a lens Defects in eye – Intraocular pressure measurement – Glaucoma – Correction of defects using lenses – Sensing & Tracing of electric pulses – EEG & ECG – NMR – magnetic resonance imaging – MRI scanning Instrument – Working of heart and lung machine – Artificial kidney .

UNIT II (15 HRS)

Effect of UV, visible & IR radiations on human body – IR lamp & IR therapy – Biological effect of radiation – Radiation damage in embryo and fetus during pregnancy – demerits of different diagnostic and theraptic methods of nuclear medicine during pregnancy – Radiation hazards in man – radiation hazards in atmosphere and space.

REFERENCE BOOKS:

1. How things work Vol. 1 & Vol. 2 :Harpens Collins Publ. India. A joint venture with The India Today Group, New Delhi (2002).
2. A text book of bio physics : R.N.Roy, Books and Allied (P) Ltd. (2001).
3. Bio medical Instrumentation : M.Arumugam
4. Optics : Brijlal & Subramaniam S. Chand & Co (2002).
5. Bio medical electronics & : Prof.S.K.Venkatraman Galgotia Pub. Instrumentation Pvt. Ltd, 2002.
6. Bio medical Instrumentation & : Leslie Cromwell, Fred.J.Weibell and Measurements Erich A. Pfeiffer PHI (2002).

DEMONSTRATION AND FIELD VISIT:

1. ECG Recording – Demonstration
2. Field Visit – MRI Scanning center
3. Field Visit – Ultrasonograph – scanning center
4. Field Visit – EYE hospital to see instruments used for ophthalmic diagnosis & Laser therapy.

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: ESP61(P)**
Semester	**: VI**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Elective**	**No. of Credits**	**: 2**

Title of the paper : PRACTICAL ELECTRIC CIRCUITS - II

COURSE OBJECTIVES:

- To discuss the heating effect of current and the principle behind electroplating.
- To explain to the students house wiring and also give practical training regarding the same.
- To help students apply the knowledge to correct simple electrical problems faced at home.

UNIT I

Heating effect of current(qualitatively) – Joule's law – heaters and flat iron – automotic temperature control(thermostat) – chemical effect of current (qualitatively) – electrolysis – Faraday's law – electroplating.

UNIT II

Single phase and three phase electrical power supply – delta, star and T connection – house wiring – switch board wiring – fan regulator connection – stair case switch connection fuse fixing – to attend to faults in a tube light circuit – to attend to flat iron connection(simple and automatic) – eliminator testing – multimeter – tester usage – lighting arrestor.

REFERENCE BOOKS:

1. Electricity & Magnetism : Brijlal & Subramaniam, S. Chand & Co. (2002).
2. Electrical technology : Theraja S. Chand & Co. (2002).
3. How things Work Vol 1 & Vol 2: Harper Collins Publ. India a joint venture with The India Today Group, N. Delhi, (2002).

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: MPL21**
Semester	**: I & II**	**No. of Hrs allotted:**	**2**
Paper	**: Lab**	**No. of Credits**	**: 3**

Title of the paper: MAJOR PRACTICAL

I B.Sc. PRACTICALS

1."E" – Uniform bending
2."E" – Non-Uniform bending
3. "E" – Cantilever Oscillations
4. "E" – Depression of Cantilever
5. "G" – Static torsion – scale and Telescope
6. Torsion Pendulum
7. Compound Pendulum
8. Viscosity – Burette, capillary tube
9. Surface tension – Quincke's drop
10. Surface tension and interfacial surface tension
11. Volume resonator
12. Lee's disc
13. Specific heat by cooling
14. Spectrometer – Dispersive power of a prism
15. M and B_H – Field along the axis of a coil
16. Current and voltage sensitiveness – MG
17. Thermo emf – Potentiometer
18. Potentiometer – Temperature coefficient of resistance
19. Calibration of Ammeter- Potentiometer
20. Voltmeter calibration – Potentiometer
21. Carey Foster's Bridge-measurement of resistance

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: MPL41**
Semester	**: III & IV**	**No. of Hrs allotted**	**: 2**
Paper	**: Lab**	**No. of Credits**	**: 3**
Title of the paper	**: MAJOR PRACTICAL**		

II B.Sc. PRACTICALS

1. Determination of Capacity (absolutely)
2. Comparison of capacities – BG
3. Comparison of mutual inductances
4. Absolute determination of mutual inductance
5. LCR circuit – series resonance
6. LCR circuit – parallel resonance
7. Bridge rectifier
8. Comparison of resistance – BG
9. Logic gates – NAND, NOR, NOT using diodes and transistor
10. Newton's rings
11. Grating normal incidence N & λ for Hg spectrum
12. Grating – wavelength by minimum deviation method
13. Grating dispersive power
14. Narrow angle prism
15. Sonameter – frequency of AC mains
16. i-d curve
17. Low pass, High pass, Band Pass RC filters

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: MPL61**
Semester	**: V & VI**	**No. of Hrs allotted**	**: 3**
Paper	**: Lab**	**No. of Credits**	**: 3**

Title of the paper : MAJOR PRACTICAL(GENERAL)

NON ELECTRONICS

1. i-i' curve
2. Resolving power of Telescope
3. Air wedge
4. Biprism (using spectrometer)
5. Polarimeter
6. Cauchy's constant
7. Hartmann's constant
8. Conversion of galvanometer into voltmeter and milliammeter
9. Thermocouple-e.m.f.
10. Owen's bridge
11. Anderson bridge
12. Maxwell bridge
13. Schering's bridge
14. Desauty's bridge
15. Grating II order spectrum
16. High resistance by leakage
17. e.c.e. of Copper

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course	**: B.Sc., Physics**	**Code No.**	**: MPL62**
Semester	**: V & VI**	**No. of Hrs allotted**	**: 3**
Paper	**: Lab**	**No. of Credits**	**: 3**

Title of the paper : MAJOR PRACTICAL (ELECTRONICS)

ELECTRONICS

1. Transistor Characteristics (CE mode)
2. Transistor Characteristics (CB mode)
3. FET Characteristics
4. OP-Amp Characteristics
5. Single Stage Amplifier
6. Hartley Oscillator
7. Colpitts Oscillator
8. Voltage Doubler
9. Dual Power supply
10. Bridge rectifier with filters
11. Astable multivibrator (using transistor)
12. Monostable multivibrator (using 555)
13. Astable multivibrator (using 555)
14. Gates (using ICs)
15. Half Adder & full Adder (Construction using IC's)
16. Zener Characteristics
17. Zener voltage regulator
18. NAND as Universal gate

Allied Papers

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc Chemistry/Mathematics **Code No. :ACL21(P)/AML41(P)**
Semester : I & II/ III & IV **No. of Hrs allotted: 2**
Paper : Practicals **No. of Credits : 2**
Title of the paper : ALLIED PRACTICAL

1. Compound pendulum
2. Torsion pendulum
3. Sonometer I and II laws
4. Uniform bending using microscope
5. Non –uniform bending using microscope
6. Melde's string
7. Surface tension using capillary rise
8. Surface and interfacial tension- drop weight method
9. Co-efficient of viscosity- using burrette
10. N and λ -Grating
11. Gates- discrete components
12. Zener diode characteristics
13. Dispersive power
14. Newton's rings
15. Air wedge
16. Sonometer AC mains
17. Carey Foster's bridge
18. Bridge rectifier
19. Conversion of galvanometer into voltmeter
20. Gates using IC's

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc. Chemistry /Mathematics **Code : AC11(P)/AM31(P)**
Semester : I / III **No. of hrs. allotted : 4**
Paper : Allied **No. of credits : 4**

PHYSICS – I

COURSE OBJECTIVE:

- To explain the basic concepts of physics in mechanics, properties of matter and optics

UNIT- I MECHANICS

Force, Work, Power and Energy Conservative and nonconservative force with example- Friction – central forces - work done by a force – work done by a varying force – Expression for kinetic energy – Expression for potential energy - power. **Rotational motion** Torque work and power in rotational motion - (derviations of expressions) – Torque and angular acceleration – Angular momentum and angular impulse – K.E. of rotation – motion along the inclined plane – diatomic molecule – reduced mass.

UNIT – II IMPULSE AND IMPACT

Impulse and momentum – Elastic and Inelastic impacts – Direct impact of two smooth spheres – Expressions of final velocities – Loss of energy due to impact

UNIT- III PROPERTIES OF MATTER

Viscosity Stokes law – Determination of a viscosity of liquid (theory and experiment) – Derivation of Peiseuille's formula (Analytical method) – Bernoullis' theorem proof and application. **Elasticity** Elastic moduli – Bending of beams – Expression for B.M – E by uniform bending (theory and experiment) – E by non –uniform bending (Theory and experiment) –I section girders – Torsion – Expression for couple per unit twist – work done in twisting – Torsion pendulum (Theory and Experiment).

UNIT IV GEOMETRICAL OPTICS

Deviation produced by a thin lens – focal length of two thin lenses in contact – Equivalent focal length of two lenses separated by a distance – Principal points – Cardinal points – Dispersion of light – Dispersion through a prism – Dispersive power.

UNIT V PHYSICAL OPTICS

INTERFERENCE : Interference in thin films – Air wedge – Newton's rings – Diffraction grating – Determination of wavelength of light using transmission grating (normal incidence) – POLARISATION : Double refraction – Huygens theory – Nicol prism – QWP – HWP – Optical activity – Biot's law – Specific rotator power – Laurent's halfshade polarimeter.

TEXT BOOK:

R. Murugeshan, Optics and Spectroscpy, S.Chand & Co., New Delhi, 1998.

REFERENCE BOOKS:

1. Sears, Zemansky and Young, University Physics (6th ed.), Narosa Publishing House, New Delhi, 2005.
2. D.S. Mathur, Elements of Properties of Matter, S. Chand & Co. New Delhi, 2004.
3. N. Venkatachalam, Optics and Spectroscopy, CMN Publications, 1999.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-17 batch onwards)

Course : B.Sc. Chemistry /Mathematics **Code : AC22(P)/AM41(P)**
Semester : II / IV **No. of hrs. allotted : 4**
Paper : Allied **No. of credits : 4**

BASIC ELECTRONICS

COURSE OBJECTIVES:

- To expose the students to the elements of semiconductor diodes and to throw light on the basics of transistors and their characteristics

ANALOG ELECTRONICS

UNIT I SEMICONDUCTOR (10 HRS)

Semiconductor Physics – intrinsic, extrinsic semiconductor – Band Energy Diagram - Energy Gap – Majority and Minority Carriers – Potential Barrier. Semi conductor diodes: Introduction – Types – PN junction – Biasing – Diode types – Characteristics – Rectifiers – Filters.

UNIT II TRANSISTORS (12 HRS)

Transistors – Biasing – Transistor as an amplifier – Current flow in a CE PNP transistor – Static characteristics – Single stage amplifier – Frequency response – Feedback in amplifier – Characteristics of negative feedback.

DIGITAL ELECTRONICS

UNIT III NUMBER SYSTEMS (14 HRS)

Binary number system: Conversion of decimal number into binary number – a Binary to decimal conversion – Binary addition – Binary subtraction – Binary multiplication and division – exadecimal numbers – Binary to hexadecimal conversion – Hexadecimal to decimal conversion – Decimal to hexadecimal conversion – Binary coded decimal – Application of BCD code.

UNIT IV LOGIC GATES (14 HRS)

Logic gates – Gate and switch – Basic logic gates and their implementation – Characteristics of logic gates – Calculation of output voltage in an OR logic gate &AND logic gate – The NOR logic gate – The NAND logic gate – The exclusive OR gate – Boolean equations of logic circuits.

UNIT V BOOLEAN ALGEBRA (10 HRS)

De Morgan's laws and its applications: Boolean algebra – De Morgan's laws – Applications – Binary adders

TEXTBOOK:

1. A. AMBROSE AND T. VINCENT DEVARAJ, *Elements of Solid State Electronics,* Mera Publications, 1993. [Unit I, Sections 3.2.1, 3.3, 3.4, 3.5, 4.1-4.5; Unit II, Sections 5.1- 5.4, 5.5.1, 5.6, 5.6.1, 6.9.1, 6.12, 7.1, 7.2, 7.3.1, 7.3.2]
2. G. Jose Robin and A. Ubald Raj, *Electronics II,* Indira Publication, 1994. [Units III, IV & V: Chapter 1, 2 (p.22-54) & Chapter 3]

M.Sc., Physics

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

M.Sc., Physics

COURSE STRUCTURE (w.e.f. 2014 – 2016 batch onwards)

Semester - I

Course	Code	Title of the Paper	Hrs.	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core -1	1PP1	Classical Mechanics	5	4	75	25	75	100
Core -2	1PP2	Statistical Mechanics	5	4	75	25	75	100
Core 3	1PP3	Advanced Electronics	5	4	75	25	75	100
Elective 1	1PPE1	Mathematical Physics – I / Computer simulations	5	5	75	25	75	100
Lab	Practicals – I*	General	5	-	75	-	-	-
Lab	Practicals – II*	Electronics	5	-	75	-	-	-
		Total	**30**	**17**	**450**	**100**	**300**	**400**

Semester - II

Course	Code	Title of the Paper	Hrs.	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 4	2PP1	Solid state physics -I	5	4	75	25	75	100
Core -5	2PP2	Electromagnetic theory	5	4	75	25	75	100
Core - 6	2PP3	Quantum mechanics-I	5	4	75	25	75	100
Elective - 2	2PPE2	Mathematical physics II/ Molecular biophysics	5	5	75	25	75	100
Lab -I	2PPL1*	General	5	5	75	40	60	100
Lab -II	2PPL2*	Electronics	5	5	75	40	60	100
		Total	**30**	**27**	**450**	180	**420**	**600**

Semester - III

Course	Code	Title of the Paper	Hrs.	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 7	3PP1	Solid state physics -II	5	4	75	25	75	100
Core -8	3PP2	Quantum mechanics II	5	4	75	25	75	100
Core - 9	3PP3	Nuclear physics	5	4	75	25	75	100
Core - 10	3PP4	Microprocessor and Micro Controllers	5	4	75	25	75	100
Lab	Practicals – III *	Advanced experiments	5	-	75	-	-	-
PJ	PJ1 *	Project	5		75	-	-	-
		Total	**30**	**16**	**450**	**100**	**300**	**400**

Semester - IV

Course	Code	Title of the Paper	Hrs.	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 11	4PP1	spectroscopy	5	4	75	25	75	100
Core -12	4PP2	nanoscience	5	4	75	25	75	100
Core - 13	4PP3	Optical communication and networking	5	4	75	25	75	100
Elective - 3	4PPE3	X-ray crystallography/ Astrophysics	5	5	75	25	75	100
Lab	4PPL1*	Advanced experiments	5	6	75	40	60	100
PJ	PJ1 *	Project	5	7	75	40	60	100
		Total	**30**	**30**	**450**	**180**	**420**	**600**

* Credit will be awarded at the end of II/IV Semester

A. <u>Consolidation of contact hours and credits: PG</u>

Semester	Contact Hrs/week	Credits
I	30	17
II	30	27
III	30	16
IV	30	30
Total	**120**	**90**

<u>B) Curriculum Credits</u>

Core --- 75Credits
Elective ---15 Credits

Total 90 Credits

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 1PP1**
Semester : I **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

CLASSICAL MECHANICS

COURSE OBJECTIVE:

- To have acquaintance with the elementary concepts of mechanics, and acquire in-depthknowledge in Lagrangian and Hamiltonian Principles.
- To understand the classical theory behind two body problems and small oscillations.
- To acquire knowledge on different types of generating functions by means of canonical transformation.

UNIT I : SURVEY OF THE ELEMENTARY PRINCIPLES , VARIATIONAL PRINCIPLES AND LAGRANGE'S EQUATIONS

Mechanics of a particle – Mechanics of a system of particles – Constraints – D'Alemberts principle and Lagrange's equation – velocity dependent potentials and the dissipation function – Simple applications of the Lagrangian formulation. Hamilton's principles – some techniques of the calculus of variations – Derivation of Lagrange's equations from Hamilton's principle – Extension of Hamilton's principle to non – conservative and non holonomic systems

UNIT II THE TWO BODY CENTRAL FORCE PROBLEM

Reduction to the equivalent one – body problem the equations of motion and first integrals- The equivalent one – dimensional problem, and classification of orbits – The viral theorem – The Kepler problem – Inverse square law of force.

UNIT III SMALL OSCILLATIONS

Formulation of the problem – The eigen value equation and principle axis transformation – frequencies of free vibration and normal coordinates – Free vibrations of linear triatomic molecule – forced vibrations and the effect of dissipative forces.

UNIT IV THE HAMILTON EQUATION OF MOTION

Legendre transformation and the Hamilton equation of motion – Cyclic coordinates and Routh procedure – conservation theorems and the physical significance of the Hamiltonian – Derivation from variational principle – The principle of least action.

UNIT V CANONICAL TRANSFORMATIONS

The equations of canonical transformation – Examples of canonical transformations – the integral invariants of Poincare – Lagrange and Poisson brackets as canonical invariants – The equations of motion in Poisson bracket notation – Infinitesimal/constant transformations, constants of the motion and symmetry properties.

TEXT BOOK:

Classical Mechanics(III ed.), Goldtsein, H., Poole, C. & Safko, J. : Pearson Education, 2002, ISBN 81 – 7808 – 566 – 6

REFERENCE BOOKS:

1. Mathematical Methods in Classical and Quantum Physics, Dass, T., & Sharma, S.K. : University Press, 198, ISBN 81-7371-089-9.
2. Classical Mechanics ,Sankara Rao, K.: Prentice-Hall of India, 2005, ISBN 81-203- 2676-8.
3. Classical Mechanics – With Introduction to Nonlinear Oscillations and Chaos, Bhatia, V.B. :, Narosa Publishing House, 1997, ISBN 81-7319-104-2.
4. Classical Mechanics – Systems of Particles and Hamiltonian Dynamics, Greiner, W:Springer, 2004, ISBN 81-8128-128-4.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 1PP2**
Semester : I **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

STATISTICAL MECHANICS

COURSE OBJECTIVES:

- Fundamentals of Statistical mechanics; Statistical distribution laws; their applications.
- Theories of specific heat capacity of solids.
- Properties of liquid helium. Phase transitions -Ising model; discussed in detail.

UNIT I

Basis Of Classical Statistics -Phase space – Ensemble – average – Liouville theorem – Conservation of extension in phase – Equation of motion and Liouville theorem – Equal a priori probability – Statistical equilibrium – Micro canonical ensemble. Quantum picture Micro canonical ensemble – Quantization of Phase space – Basic postulates – Classical limit – Symmetry of wave function – Effect of symmetry on counting – Various distributions using micro canonical ensemble – Density matrix.

UNIT II

Canonical And Grand Canonical Ensembles - Ideal gas in canonical ensemble – Maxwell velocity distribution – Equipartition of energy – Grand canonical ensemble – Ideal gas in grand canonical ensemble – Comparison of various ensembles – Quantum distributions using other ensembles – Photons –- Partition Function - Canonical partition function – Molecular partition function – Translational partition function – Rotational partition function – Vibrational partition function – Homo nuclear molecules and nuclear spin.

UNIT III

Ideal Bose – Einstein Gas Bose – Einstein distribution - Bose – Einstein Condensation – Thermodynamic properties of an ideal Bose – Einstein gas – Liquid Helium – Two – Fluid model of Liquid Helium – Landau spectrum of phonons and rotons – 3He – 4He mixtures.

UNIT IV

Ideal Fermi – Dirac Gas Fermi – dirac distribution – Electrons in metals – Thermionic emission – White Dwarfs – Semiconductor Statistics Statistical equilibrium of free electrons in semiconductors – Nondegenerate case – Impurity semiconductors – Degenerate semiconductors.

UNIT V

Cooperative Phenomena : Ising Model Phase transitions of the second kind – Ising model – Bragg – William approximation – Fowler – Guggenheim Approximation – Kirkwood method – One-dimensional Ising model

TEXT BOOK:

Statistical mechanics (II ed.) Agarwal, B.K. & Eisner, M.:, New Age International, 2006, ISBN-81-224-1157-6.

]REFERENCE BOOKS:

1. Elementary Statistical Mechanics ,Gupta, S.I & Kumar, V.:, Pragati Prakashan, 2006
2. Heat and Thermodynamics (VI ed.), Zemansky, M.W. & Dittman, R.H.: McGraw Hill, 1989. ISBN 0-07-Y66647-4.
3. Statistical Mechanics, Huang, K.: Wiley Eastern, 1988. ISBN 0-85226-393-1.
4. Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Sears, F.W. & Salinger, G.L.: Narosa Publishing House, 1991. ISBN 81-85015-71-6.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 1PP3**
Semester : I **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

ADVANCED ELECTRONICS

COURSE OBJECTIVES:

- To be familiar with the various uses of Op-amps.
- To relate the theory and experiments
- To be familiar with the combinational sequential circuits

UNIT I SEMICONDUCTOR DEVICES

Field effect transistor: The ideal voltage controlled current source – the Junction Field Effect transistor – the JFET volt – ampere characteristics – JFET transfer characteristics – The MOSFET – The enhancement MOSFET – volt – ampere characteristics – The depletion MOSFET – MOSFET circuit symbols – The DC analysis of FETS – The MOSFET as a resistance – switch – amplifier – small – signal FET models – CMOS devices.

UNIT II AMPLIFIER SYSTEMS

Op.amp – architectures – The gain stage with active load – The differential stage – DC level shifting – output stages – offset voltages and currents – Measurements of op – amp parameters – Frequency response and compensation – slew rate – BIFET and BIMOS circuits - Three stage Op.amp – MOS Op amp.

UNIT III DIGITAL CIRCUITS AND SYSTEMS

Combinatorial – Digital circuits: Standard Gate assembling Binary adders – Arithmetic functions – Digital comparators – Parity checker – Generators – Decoder - Demultiplexer – Data selector – multiplexer encoder – Read only Memory (ROM) – Two dimensional addressing of a ROM – ROM applications – programmable ROMs. – Erasable PROMS – programmable array logic – programmable logic arrays. Sequential circuits and systems: A1 Bit memory – The circuit properties of a Bistable Latch – The clocked SR Flip flops. J - K, – T -, and D - type Flip flops – shift registers – Ripple counters – Synchronous counters – Application of counters.

UNIT IV VERY LARGE SCALE INTEGRATED SYSTEMS

Dynamic MOS shift registers – Ratioless shift register stages – CMOS Domino logic - Random Access Memory (RAM) – Read - write memory cells – Bipolar RAM cells – Charge coupled device (CCD) – CCD structures – Integrated - Injection logic(I2L) – Microprocessors and Micro computers.

UNIT V WAVE FORM GENERATORS AND WAVESHAPING

Wave form Generators and waveshaping : Sinusoidal oscillators – Phase shift: oscillator – Wien bridge oscillator – General form of oscillator configuration – crystal oscillators – multivibrators – comparator – square - wave generation from a sinusoid – Regenerative comparator – Square and triangle - wave generators – pulse generators – The 555 IC timer – voltage time - base generators – step generators – modulation of a square wave.

TEXT BOOK:

Micro Electronics (II ed.), Millman, J & Grabel, A.: Tata McGraw Hill, 2002, ISBN 0-07-463736-3.

Unit – I Chapter- 4 ; Unit – II Chapter-14; Unit – III Chapter-7 & 8

Unit – IV Chapters-9 ; Unit – V Chapters-15

REFERENCE BOOK:

Digital Principles and application (VI ed.) Malvino, A.P. & Leech, D andGoutam Saha : Tata McGraw Hill, 2006, ISBN 0-07- 060175-5.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 1PPE1(M)**
Semester : I **No. of hrs. allotted : 5**
Paper : Elective **No. of credits : 5**

MATHEMATICAL PHYSICS – I

COURSE OBJECTIVE

- ✓ Students will be taught to understand and appreciate the application of mathematical principles to practical problems in various branches of Physics.

UNIT I CURVILINEAR COORDINATES :

Transformation of coordinates – Jacobian of transformations - Orthogonal curvilinear coordinates – Coordinate surfaces and coordinate curves – Scale factors and unit vectors in curvilinear systems – Arc length and volume elements – Gradient, divergence and curl in orthogonal curvilinear systems – Special orthogonal coordinate systems – Cylindrical and spherical coordinate systems – Position vector, velocity, acceleration, Gradient, Divergence, Curl and Laplacian.

Chapter 7 - *Schaum's outline of theory and problems of vector analysis and an introduction to tensor analysis*, SPIEGEL, M.R., McGraw Hill, 1959, ISBN:07-060228-X.

UNIT II DETERMINANTS AND MATRICES :

Linear, homogeneous and inhomogeneous equations – Examples – Solving linear equations (Gauss elimination) – Matrix inversion (Gauss-Jordan) – Orthogonal matrices, direction cosines, applications to vectors, orthogonality conditions (two-dimensional case) – Symmetry property and similarity transformations – Hermitian and unitary matrices – Pauli matrices – Eigenvalues and eigenvectors - Diagonalisation of matrices.

Chapter 3 – *Essential mathematical methods for physicists*, WEBER, H.J. & ARFKEN, G.B., Academic Press, 2003, ISBN:0-12-059877-9

UNIT III THE BETA AND GAMMA FUNCTIONS : Definitions-symmetry property of Beta Functions-evaluation of Beta Functions - transformation of Beta Functions -evaluation of Gamma Function- transformation of Gamma Functions- relation between Beta and Gamma Functions-evaluation of miscellaneous integrals-miscellaneous important prepositions.

UNIT IV SPECIAL FUNCTIONS-I : Legendre's differential equation and Legendre Functions – Generating function of Legendre Polynomial-Rodrigue's formula for Legendre Polynomials–orthogonal properties of Legendre's polynomial- – Recurrence Formulae for $P_n(x)$

UNIT V SPECIAL FUNCTIONS-II : Bessel's differential equation: Bessel's polynomial – Recurrence Formulae for $J_n(x)$– generating function for $J_n(x)$–Jacobi series-Bessel's integrals-Orthonormality of Bessel's functions-spherical Bessel's function-Recurrence relation-Orthogonality of Spherical Bessel's functions.

TEXT BOOK for Unit III, IV AND V

Mathematical Physics with Classical Mechanics, Satya Prakash, Sultan Chand & Sons, 2005, ISBN:81-7014-925-8

UNIT III: Chapter 4 (sec 4.1-4.9)

UNIT IV: Chapter 6 (sec 6.7-6.11)

UNIT V: Chapter 6 (sec 6.17, 6.21-6.25,6,28,6.28a,6.28b)

REFERENCE BOOKS:

1. *Mathematical Methods for Physics and Engineering (II ed.)*, Riley, K.F., Hobson, M.P.& Bence, S.J. : Cambridge, 2004, ISBN:0-521-61296-9.
2. *Mathematical Physics – Differential Equations and Transform Theory*, Ghatak, A.K., Goyal, I.C. & Chua, Macmillan, 2002, ISBN:0-333-92548-3.
3. *Mathematical Physics (II ed.)* Gupta, B.D. : Vikas Publishing House, 1993, ISBN:0-7069-76-4.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 1PPE1(C)**
Semester : I **No. of hrs. allotted : 5**
Paper : Elective **No. of credits : 5**

COMPUTER SIMULATIONS

COURSE OBJECTIVES:

- To understand the importance of computers in physics.
- To give exposure to different numerical methods.

UNIT I

Importance of Computers in Physics – Nature of Computer Simulation – Importance of Graphics – Programming Languages – Euler Algorithm – Example Coffee Cooling problem – Accuracy and stability – Visualization – Nuclear decay – Simple Harmonic Motion Motion – Numerical solution to simple harmonic oscillator of falling objects – Simple pendulum – Dissipative systems – Response to external forces – Electrical circuit oscillations

UNIT II

Chaotic motion of dynamical systems – periodic doubling – measuring and controlling chaos – Forced damped pendulum – Hamiltonian chaos – Perspective – Order – disorder – Poisson distribution and nuclear decay - introduction to0 random walks – Problems in probability – method of least squares – Simple variational Monte Carlo method – Random walks and diffusion equations.

UNIT III

Random walks, modified random walks, application to polymers, diffusion controlled chemical Numerical integration and Monte Carlo methods, numerical integration one and multi dimensional integrals, Monte carlo error, non uniform probability distributions, neutron transport, importance sampling, Metropolis Montecarlo method, error estimates for numerical integration, acceptance-rejection method, al reactions random number sequences.

UNIT IV

Percolation, cluster labeling, critical exponents and finite size scaling, renormalization group. Fractal dimension, Regular fractals and growth processes, fractala and chaos.

UNIT V

Micro canonical ensemble, Demon alogorithm, one dimensional classical ideal gas, the temperature and the canonical ensemble, Ising model, Heat flow, relation of the mean energy to the temperature. Monte carlo simulation of canonical ensemble, Metropolis algorithm, verification of Boltzman distribution, Ising model, Ising phase transition, applications of Ising model, simulation aof classical fluids, optimized Monte Carlo data analysis, other ensembles, fluctuation in the canonical ensemble, exact enumeration of the 2 x 2 Ising model.

TEXT BOOK:

An Introduction to Computer simulation methods (Application to Physical systems) – II edition , Harvey Gould and Jan Tobochnik, Addison-Wesley Publishing Company 1996.
Unit 1: Pages 1-36, 95-126 (67 Pages) , Unit 2: Pages 127-212 (85 Pages), Unit 3: Pages 343-405 (63 Pages) Unit 4: Pages 413-500 (87 Pages),Unit 5: Pages 543-625 (82 Pages)

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PP1**

Semester : II **No. of hrs. allotted : 5**

Paper : Core **No. of credits : 4**

SOLID STATE PHYSICS - I

COURSE OBJECTIVES:

- To understand fundamentals of solid structure of materials.
- To discuss the properties of phonons.
- To impart the knowledge of free electron Fermi gas.
- To give exposure to semiconductor energy bands and the methods of calculation.

UNIT I CRYSTAL PHYSICS

Periodic arrays of atoms: Lattice translation vectors – Primitive lattice cell –Fundamental types of lattices: Two and three dimensional lattice types – Miller indices of crystal planes – Simple crystal structures : NaCl, CsCl, hcp, Diamond, Cubic ZnS – Bragg law – Fourier analysis – Reciprocal lattice vectors – Diffraction conditions – Laue equations – Brillouin zones : Reciprocal lattice to sc, bcc, fcc lattices – Structure factor of the bcc, fcc lattice.

UNIT II CRYSTAL BINDING AND ELASTIC CONSTANTS

Crystals of inert gases (van der Waals – London interaction) – Ionic crystals (Madelung constant) – Covalent crystals – Metals – Hydrogen bonds – Atomic radii – Analysis of Elastic constants – Elastic compliance and stiffness constants – Elastic waves in cubic crystals.

UNIT III PHONONS

Vibrations of crystals with mono atomic basis – Two atoms per primitive basis – Quantization of elastic waves (Phonons) – Phonon momentum – Inelastic scattering by phonons – Phonon heat capacity : Planck distribution, Density of states in one and three dimension – Debye and Einstein model of specific heat capacity.

UNIT IV FREE ELECTRON FERMI GAS & ENERGY BANDS

Energy levels in one dimension – Fermi – Dirac distribution for a free electron gas – Free electron gas in three dimensions – Heat capacity of the electron gas - Nearly free electron model: Origin and magnitude of energy gap – Bloch functions – Kronig – Penny model – Wave equation of an electron in a periodic potential: Bloch theorem, crystal momentum.

UNIT V SEMICONDUTORS, FERMI SURFACES AND METALS

Semiconductors: Band gap – Equations of motion – Holes and effective mass – Physical interpretation of the effective mass – Effective masses in semiconductors – Intrinsic carrier concentration, Impurity conductivity- Calculation of energy bands: Tight binding method – Wigner – Seitz method – Cohesive energy – Pseudopotential methods – Experimental methods: Quantization of orbits in a magnetic field – De Haas – van Alphen effect.

TEXT BOOK:

Introduction to Solid State Physics (VII ed.) ,Kittel, C. :, John Wiley & Sons, 1996. ISBN : 81 – 265 – 1045 – 5

Unit – I Chapter- 1 & 2;Unit – II Chapter- 3;Unit – III Chapters- 4 & 5

Unit – IV Chapters- 6 & 7; Unit – V Chapters- 8 & 9

REFERENCE BOOKS:

1. Introductory Solid State Physics (II ed.),Myers, H.P.:, Viva Low – priced Student Edition, Viva Books Pvt. Ltd, 1998.
2. Elementary Solid State Physics ,Omar, M. A.:, Pearson Education, 2006, ISBN 81- 7758-377-8
3. Solid State Physics – An Introduction to Theory and Experiment, Ibach, H. & Luth, H.: Narosa Publishing House, 1991.
4. Solid State Physics, (revised VI Edition), Pillai, S.O.: New Age International, 2007.
5. Elements of Solid State Physics (II ed.) Srivatsava, J.P.: Phi Publishers, 2007, ISBN 978-81-203-2847-1.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PP2**

Semester : II **No. of hrs. allotted : 5**

Paper : Core **No. of credits : 4**

ELECTROMAGNETIC THEORY

COURSE OBJECTIVES:

- This paper deals with the fundamental principles of electrostatics, magnetostatics and electrodynamics.
- Make the student familiarize with the application of Maxwell's equations to physical situations and propagation of electromagnetic waves in conducting media.
- Students will be taught the essential principles of electrodynamics and its applications.

UNIT I ELECTROSTATICS

Electric charge – Coulomb's law – Electric field – Electrostatic potential – Gauss law and its applications – The electric dipole – Multipole expansion of electric fields. Poisson's equation – Laplace's equation : Properties of solutions (Uniqueness theorem) – Solutions to Laplace's equation in spherical coordinates (Zonal harmonics) – Usefulness of zonal harmonics (conducting sphere in a uniform electric field) – Electrostatic images – Point charge and conducting sphere – Line charges and line images.

UNIT II MAGNETOSTATICS

Definition of magnetic induction – Forces on current carrying conductors – Biot – Savart Law – Elementary applications of Biot – Savart law – Ampere's circuital law – Magnetic vector potential – The magnetic field of a distant circuit – Magnetic scalar potential – Magnetic flux.

UNIT III MAXWELL'S EQUATIONS

Generalization of Ampere's law – Maxwell's equations, differential and integral forms – Electromagnetic energy (Poynting vector) – Plane monochromatic wave : in free space, conducting and non – conducting media.

UNIT IV APPLICATION OF MAXWELL'S EQUATIONS

Boundary conditions – reflection and transmission - Reflection and refraction of electromagnetic waves at normal and oblique incidence – Waveguides – TE waves in a rectangular waveguide.

UNIT V POTENTIALS AND RADIATION

Gauge transformation – Coulomb gauge and Lorentz gauge – Retarded potentials – The Lienard – Wiechert potentials – Radiation from a moving point charge – Electric dipole radiation – Magnetic dipole radiation – Radiation from an arbitrary source.

TEXT BOOKS:

1. Foundations of electromagnetic theory (III ed.), Reitz, J.R., Milford, F.J & Christy, R.W. Narosa Publishing House, 1998. ISBN 81-85015-79-1. (For units I & II).
2. Electromagnetic theory (V ed.), K. K. Chopra, G. C. Agarwal, K. Nath & Co., 2010. (For unit III).
3. Introduction to Electrodynamics (III ed.), David J. Griffiths, Prentice Hall of India, 2000. ISBN 81-203-1601-0. (For units IV & V).

REFERENCE BOOKS:

1. Electromagnetic Fields and Waves (II ed.), Lorrain, P. & Corson, D.R. : CBS Publishers & Distributors, 2000.
2. Electromagnetic Theory and Applications ,Mukhopadhyay, P. ,Tata McGraw Hill, 1993. ISBN 0-07-460244-6.
3. Engineering Electromagnetics (V ed.), Hayt Jr., W.H. : McGraw Hill, 2001. ISBN 97-8007-2524-956.
4. Introduction to Electrodynamics ,Capri, A.Z. & Panat, P.V. :, Narosa Publishing House, 2002. ISBN 81-7319-329-0.
5. Electromagnetic Waves and Radiating Systems ,Jordan, E.C. & Balmain, K.G. : (II ed.), Prentice – Hall of India, 2003. ISBN 81-203-0054-8

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PP3**

Semester : II **No. of hrs. allotted : 5**

Paper : Core **No. of credits : 4**

QUANTUM MECHANICS – I

COURSE OBJECTIVES:

- To understand Basic concepts in Quantum Mechanics.
- To throw light on the formulation of Schrodinger,Dirac and Heissenberg mechanics
- To have a glimpse of perturbation theory and its applications.
- To study in detail, the effect of magnetic and electric field on quantum particles.

UNIT I EQUATION OF MOTION OF MATTER WAVES

Time independent Schrodinger equation – Schrodinger equation for a free particle – Time dependent Schrodinger equation – Physical interpretation of wave function – Normalized and orthogonal wave functions – Solution of Schrodinger equation – Stationary state solution – Expectation values – Probability current density – Superposition of plane waves – Formulation of Schrodinger equation in momentum representation – Uncertainty principle – one dimensional square well potential – Linear Harmonic oscillator – Hydrogen atom.

UNIT II MATRIX FORMULATION OF QUANTUM MECHANICS

Matrix algebra – types of matrices – Hermitian and unitary matrices – Hilbert space – Dirac's bra and Ket notation. Physical meaning of matrix elements – Equations of motion – Schrodinger picture – Heisenberg picture – Interaction picture – Poisson brackets and Commutator brackets – Matrix theory of Harmonic oscillator.

UNIT III GENERAL FORMALISM OF QUANTUM MECHANICS

Linear operator-Eigen functions and Eigen values- Hermitian Operator-postulates of quantum mechanics- Dirac's notation- Equations of motion.

UNIT IV ANGULAR MOMENTUM STATES

Commutation relations for the generators – Choice of representation, Values of m, f(j), and □m. Angular momentum matrices (j = ., j = 1 only) – Combination of Angular momentum states – Eigen values of the total Angular momentum – Clebsch Gordan coefficients – Recursion relations – Construction procedure – $j_1 = 1/2$, $j_2 = 1/2$

UNIT V APPROXIMATION METHODS FOR BOUND STATES

Stationary perturbation theory – non degenerate case – First order perturbation – Evaluation of first order Energy – Evaluation of first order correction to wave function –Zeeman effect without electron spin – First order stark effect in hydrogen atom – Variation method : Expectation value of the energy – Application to excited states – Ground State of Helium atom – Variation of the parameter Z.

TEXT BOOKS:

1. Quantum Mechanics (III ed.), Schiff, L.I. : McGraw Hill, 1968, ISBN-0-07-085643-5.
2. Quantum Mechanics ,Satyaprakash & Swati Satya :, Kedar Nath Ram Nath & Co, 2006.
3. Quantum Mechanics Aruldhas, J. :, Prentice – Hall of India, 2002, ISBN81- 203-1962.

REFERENCE BOOKS:

1. A Text Book of Quantum Mechanics, Mathews, P.M. & Venkatesan, K., Tata McGraw Hill, 1978, ISBN 0-07-096510-2.
2. Quantum Mechanics (II ed.), Bransden, B.H. & Joachain, C.J. : Pearson Education, 2005. ISBN 81-297-0470-6.
3. Quantum Mechanics (III ed.), Merzbacher, E. : John Wiley, 2004, ISBN9971- 51-281-5.
4. Introduction to Quantum Mechanics Ghatak, A. :, Macmillan, 1996, ISBN0333- 92419

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PPE2(M)**

Semester : II **No. of hrs. allotted : 5**

Paper : Elective **No. of credits : 5**

MATHEMATICAL PHYSICS – II

COURSE OBJECTIVES:

- ✓ To help students develop problem solving skills.
- ✓ To explain how mathematical concepts are applied in the solution of physical problems.
- ✓ To explain the basic concepts of group theory and to discuss its application to crystallography.

UNIT I COMPLEX VARIABLES-I

Function of a complex variable-analytic functions-Necessary and sufficient condition for a function to be analytic (CR equations) – Laplace's equation: Harmonic functions – Line integral of a complex function – Cauchy's integral theorem (elementary proof and Goursat's proof: lemma I) – Cauchy's Integral formula – Derivatives of an analytic function – Taylors series – Laurent's series.

UNIT II :COMPLEX VARIABLES-II

Singularities of an analytic function – Residues and their evaluation – Cauchy's residue theorem – Evaluation of definite integrals: integration round the unit circle – Evaluation of improper real integrals – evaluation of infinite integrals by Jordan's lemma – evaluation of infinite integrals when the integrand has poles on real axis.

UNIT III: GROUP THEORY REPRESENTATION

Representation of groups – reducible and irreducible representations –some important theorems on representations – The orthogonality theorem – Character of a representation: character tables – The unitary group – Point groups.

UNIT-IV LAPLACE TRANSFORMS

Laplace transforms-Properties of Laplace transforms – Laplace transform of derivative of a function- Laplace transform of integrals -Inverse Laplace theorem-properties of LT- Convolution or Faltung theorem

UNIT-V FOURIER SERIES AND FOURIER TRANSFORM

Fourier series- Dirichlet's theorem and Dirichlet's conditions--change of interval from $(-\pi,\pi)$ to $(-l, l)$-Complex form of Fourier series-Fourier series in the interval (0,T)-change of interval from (0, T) to (0, 2l)-Physical examples of Fourier series (Full wave rectifier, square wave and saw tooth wave). Fourier transform-Properties of Fourier transform(properties 1 to 7 and property 9)-Fourier transform of a derivative-Fourier sine and cosine transforms-Finite Fourier transforms-Applications of Fourier transforms

TEXT BOOK:

1. *Mathematical Physics with Classical mechanics (IV ed.)* Satya Prakash: S. Chand & Sons, 2005, ISBN:81-7014-925-8.

UNIT I: Chapter 5 [sec 5.7, 5.9-5.12, 5.14, 5.16, 5.17, 5.20, 5.21]
UNIT II: Chapter 5[5.22-5.24, 5.25(a), 5.25(b), 5.25(c), 5.25(d)]
UNIT III: Chapter 12[12.18-12.24]
UNIT IV: Chapter 9 [9.9-9.12, 9.15, 9.17]
UNIT V: Chapter 7[7.1-7.6, 7.8] and Chapter 9 [9.2-9.5, 9.7, 9.8]

REFERENCE BOOKS:

1. *Mathematical Physics (II ed.)*, Gupta, B.D : Vikas Publishing House, 1993, ISBN:0-7069-76-4.
2. *Essential Mathematical Methods for Physicists*, Weber, H.J. & Arfken, G.B.: Academic Press, 2004, ISBN:0-12-059878-7.
3. *Mathematical Methods for Physics and Engineering (II ed.)*, Riley, K.F., Hobson, M.P.& Bence, S.J. : Cambridge, 2004, ISBN:0-521-61296-9.
4. *Mathematical Physics – Differential Equations and Transform Theory*, Ghatak, A.K.,Goyal, I.C. & Chua, S.J.: Macmillan, 2002, ISBN:0-333-92548-3.
5. *Group Theory & Quantum Mechanics*, Tinkham, M. : Tata McGraw Hill.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PPE2(MB)**

Semester : II **No. of hrs. allotted : 5**

Paper : Elective **No. of credits : 5**

MOLECULAR BIOPHYSICS

COURSE OBJECTIVES :

- To introduce the students to the fundamentals of proteins and nucleic acids.
- To enable the students understand the spectroscopic techniques involved in the elucidation of structures of molecules.
- To help the students understand and appreciate techniques such as NMR, Laser and Holography.
- To expose the students to the principles and facts of the biological effects of radiation.

UNIT I PROTEINS

Proteins : Amino acids – Structural Organisation of Proteins – Globular and Fibrous Proteins – Dynamics of Protein-folding – Protein Engineering.

UNIT II NUCLEIC ACIDS

Nucleic Acids: Nucleic Acids – Principle of Base-pairing/Base stacking – Nucleic acid Families – Protein Ligand Interactions.

UNIT III SPECTROSCOPIC TECHNIQUES IN STRUCTURE DETERMINATION

Rayleigh Scattering – Diffusion – Sedimentation – Osmosis – Viscosity – Chromatography and Electrophoresis – Optical Activity – Absorption spectroscopy – UV, IR, Raman, ESR and Mossbauer Spectroscopy.

UNIT IV NUCLEAR MAGNETIC RESONANCE, LASERS AND HOLOGRAPHY

One-dimensional – Multidimensional NMR Spectroscopy – Applications – Biomedical NMR. Lasers – Holography.

UNIT V RADIATION BIOPHYSICS

Ionising Radiation – Interaction of Radiation with Matter – Measurement of Radiation (Dosimetry) Radioactive Isotopes – Biological Effects of Radiation – Radiation Protection and Therapy.

TEXT BOOK:

Essentials of Biophysics , P. NARAYANAN , New Age International Publishers, New Delhi, 1998.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 3PP1**
Semester : III **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

SOLID STATE PHYSICS – II

COURSE OBJECTIVES:

- To understand fundamentals of solid state particles viz., Plasmons, Polaritons, and Polarons.
- To explain Superconductivity in detail.
- To distinguish and understand between different types of magnetic and electric materials, classical and quantum mechanical treatment.
- To throw light on Magnetic Resonance and different types of defects in crystals.

UNIT I PLASMONS, POLARITONS, POLARONS, OPTICAL PROCESSES AND EXCITONS

Plasmons – Electrostatic screening: Screened Coulomb potential, Pseudopotential component U(O), Mott metal-insulator transition, Screening and phonons in metals. Polaritons – Lyddane-Sachs-Teller relation. Electron-electron interaction. - Excitons: Frenkel excitons – Weakly bound (Mott-Wannier) excitons – Exciton condensation into electron-hole drops (EHD). Raman effect in crystals.

UNIT II SUPER CONDUCTIVITY

Occurrence of superconductivity – Destruction of superconductivity by magnetic fields – Meissner effect – Heat capacity – Energy gap – Microwave and Infrared properties – Isotope effect – Thermodynamics of the superconducting transitions – London equation – Coherence length – BCS theory of superconductivity – Flux quantization in a superconducting ring – Duration of persistent currents – Type I and Type II superconductors – Vortex state – Single particle tunneling – Josephson superconductor tunneling .

UNIT III DIELECTRICS AND FERROELECTRICS

Macroscopic electric field – Local electric field at an atom – Dielectric constant and polarizability (Clausius-Mossotti relation) – Electronic polarizability – Structural phase transition – Ferroelectric crystals – Classifications of ferroelectric crystals – Displacive transitions: Soft optical phonons – Anti-ferro electricity – Ferroelectric domains – Piezoelectricity – Ferroelasticity – Optical ceramics.

UNIT IV PARAMAGNETISM AND FERROMAGNETISM

Paramagnetism – Quantum theory of paramagnetism: Rare earth ions – Hund rules – Iron group ions – Crystal field splitting – Quenching of the orbital angular momentum –Cooling by isentropic demagnetization: Nuclear demagnetization – Paramagnetic susceptibility of

conduction electrons – Ferromagnetic order – Curie-Weiss law, Heissenberg model, Exchange energy – Magnons: Quantization of spin waves .

UNIT V MAGNETIC RESONANCE AND POINT DEFECTS:

Magnetic Resonance: Equations of motion – Line width – Motional narrowing – Hyperfine splitting – Examples: paramagnetic point defects – knight shift- Point defects: Lattice vacancies –Schottky and Frenkel defects – Color centers – F centers – Other centers in alkali halides.

TEXT BOOK:

Introduction to Solid State Physics (VII ed.), Kittel. C, John Wiley & Sons, 1996. ISBN: 81-265-1045-5.

Unit – I Chapter- 10 & 11 ; Unit – II Chapter- 12

Unit – III Chapters- 13; Unit – IV Chapters- 14 &15

Unit – V Chapters- 16 (partly) & 18

REFERENCE BOOKS:

1. Introductory Solid State Physics (II ed.), Myers, H.P.: Viva Low – priced Student Edition, Viva Books Pvt. Ltd, 1998.
2. Elementary Solid State Physics, Omar, M. A. :, Pearson Education, 2006, ISBN 81-7758-377-8.
3. Solid State Physics – An Introduction to Theory and Experiment, Ibach, H. & Luth,H.: Narosa Publishing House, 1991.
4. Solid State Physics, (revised VI Edition), Pillai, S.O.: New Age International, 2007.
5. Elements of Solid State Physics (II ed.) Srivatsava, J.P.: Phi Publishers, 2007, ISBN 978-81-203-2847-1.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 3PP2**

Semester : III **No. of hrs. allotted : 5**

Paper : Core **No. of credits : 4**

QUANTUM MECHANICS – II

COURSE OBJECTIVES:

- To understand Advance level - Quantum Mechanics.
- To acquire knowledge on approximation methods employed in solving quantum mechanical problems.
- To throw light on relativistic mechanics and quantum theory of radiation.
- To have a glimpse of perturbation theory and its applications.

UNIT I TIME DEPENDENT QUANTUM APPROXIMATIONS

Time-Dependent perturbation theory – First order perturbation – Perturbation constant in time – Physical significance – Transition probability – Fermi's golden rule – Harmonic perturbation – Adiabatic approximation – Sudden approximation.

UNIT II QUANTUM THEORY OF SCATTERING

General Formulation of Scattering Theory Born Approximation – Condition for validity of Born Approximation – Scattering by a screened coulomb potential : Rutherford's scattering formula from Born approximation – Partial wave analysis (Theory only).

UNIT III IDENTICAL PARTICLES AND SPIN

Identical particles – Physical meaning of identify – Symmetric and antisymmetric wave functions – Construction from unsymmetrized function – Distinguishability of identical particles – Exclusion principle – Connection with statistical mechanics – Paulil's spin matrices for an electron and their properties – Electron spin matrices for an electron and their properties – Electron spin functions – Symmetric and antisymmetric wave function of a hydrogen molecule.

UNIT IV RELATIVISTIC WAVE EQUATIONS

Schrodinger's relativistic equation for a free particle – Klien-Gordon equation – E.M. potentials – Separation of the equation – Energy levels in a Coulomb field – Dirac's relativistic equation – Dirac matrices – Free particles solution – Charge and current densities – Magnetic moment of the electron – Spin angular momentum of the electron – Approximate reduction (spin-orbit energy) – Negative energy states.

UNIT V QUANTUM THEORY OF RADIATION

Transition probability for emission and absorption – Einstein's coefficients in a radiation field – Einstein's transition probabilities for absorption and emission in a radiation field.

TEXT BOOK:

Quantum Mechanics (III ed.), Schiff, L.I. :McGraw Hill, 1968, ISBN-0-07-085643-5.

REFERENCE BOOKS:

1. Quantum Mechanics, Satyaprakash & Swati Satya : Kedar Nath Ram Nath & Co, 2006.
2. A Text Book of Quantum Mechanics ,Mathews, P.M. & Venkatesan, K. :, Tata McGraw Hill, 1978, ISBN 0-07-096510-2.
3. Quantum Mechanics Aruldhas, J.- Prentice – Hall of India, 2002, ISBN 81-203-1962-1.
4. Quantum Mechanics (II ed.), Bransden, B.H. & Joachain, C.J. : Pearson Education, 2005. ISBN 81-297-0470-6.
5. Quantum Mechanics (III ed.), Merzbacher, E. : John Wiley, 2004, ISBN 9971-51-281-5.
6. Introduction to Quantum Mechanics ,Ghatak, A. :, Macmillan, 1996, SBN 0333-92419-3.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 3PP3**
Semester : III **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

NUCLEAR PHYSICS

COURSE OBJECTIVES:

- This paper deals with the fundamental concepts in Nuclear Physics.
- Theories involved in the understanding of nuclear forces and reactions are taught.
- Students are exposed to the various theories and mechanisms of radioactive decay.
- An introduction to high energy neutron physics and elementary particles are made.

UNIT I NUCLEUS

Nuclear size – Mirror nuclei – Elastic scattering of electrons by nuclei – Muonic X-rays – Electric multipole moments – Spheroidal nuclei – Nuclear magnetic moment – The Schmidt model – Nuclear shell Model: Magic numbers – The independent particle model Nuclear ground state configurations and spins – Low-lying energy levels.

UNIT II NUCLEAR FORCE

The short range force – General form of the nucleon-nucleon potential –Exchange forces – Meson theory of nuclear forces – Experimental evidence – Low energy nucleon-nucleon scattering.

UNIT III α, βAND γ DECAY

One dimensional potential barrier problem in a decay – Theory of □-decay – □-particle energy spectrum – Fermi's theory of □-decay – Classification of nuclear transitions – Parity violation in □-decay – Electric & magnetic multipole radiation – Selection rules – Internal conversion – Nuclear isomers – Mossbauer effect.

UNIT IV NUCLEAR REACTIONS

The compound nucleus model – The optical model – The direct reaction model – Nuclear fission – Nuclear fusion – Heavy ion reactions: Stability of heavy nucleus – Recent trends in nuclear structure physics – Super heavy elements – Relativistic heavy ion collisions

UNIT V SUB-NUCLEAR PHYSICS

Proliferation and classification of elementary particles and their interactions – Short lived resonance states – Gellmann-Okuba mass formula – Quarks as building blocks of hadrons – Baryon magnetic moments – Discovery of heavier quarks – Colour degree of leptons freedom.

TEXT BOOK:

Nuclear Physics, Devanathan, V, Narosa Publishing House, 2006,
ISBN: 10-81-7319-704- 0.
Unit I - Chapter 2, p. 9-42, Chapter 3, p. 43-67, Chapter 6, p.129-141;
Unit II - Chapter 4, p. 68-105; Unit III - Chapter 8, 9 & 10, p. 194-246.
Unit IV - Chapter 12 & 13, p. 269-310; Unit V - Chapter 14, p. 311-329.

REFERENCE BOOKS:

1. Nuclear Physics – Theory and Experiment, Roy, R.R. & Nigam, B.P.: New Age International, 1996. ISBN 0-85226-788-6.
2. Introductory Nuclear Physics, Krane, K.S.: John Wiley & Sons, 1987, ISBN: 97-80471-80553-3.
3. Basic Ideas and Concepts in Nuclear Physics (II ed.), Heyde, K.: Overseas Press, 2005. ISBN 81-88689-08-4.
4. Nuclear Physics – Principles and Applications Lilley, J. :, John Wiley & Sons, 2001. ISBN 9-812-53004-5.
5. Introductory Nuclear Physics, Krane, K.S. : John Wiley & Sons, 1987. ISBN: 9780471805533.

THIAGARAJAR COLLEGE , MADURAI - 625 009
(Re Accredited With 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014– 16 batch onwards)

Course : M.Sc. Physics **Code : 3PP4**
Semester : III **No. of hrs. allotted: 5**
Paper : Core **No. of credits : 4**

MICROPROCESSOR AND MICROCONTROLLERS

COURSE OBJECTIVES:

_ To enable the students to understand the architecture and assembly programming of 8085, 8086.
_ To know the algorithms, Opcode for the basic microprocessor 8085
_ To know the concept and types of microcontrollers

UNIT I

Evolution of microprocessors – Various languages – Mnemonics – RAM – ROM – Main memory Secondary memory – Buses – Computers – Large small network – LAN –CAD – Voice recognition – AI – Block diagram of 8085 – Pin out diagram – Explanation – Registers – 8085 Instructions – Opcode – Operand – words.

UNIT II

Instruction cycle – Fetch cycle – Timing diagram – Machine cycle – T states – Opcode fetch operation – MVI, r data memory read – Memory write – Groups of instruction – Explanation of various groups with examples – various addressing modes – Stacks – PUSH operation – subroutine.

UNIT III

ALP – Simple program – 8-bit addition – 8-bit subtraction – sum 16 bits – 8 bit decimal subtraction – One's compliments of 16 bit number – Two's compliments of 16 bit number – Largest number in an array – smallest number in an array – Arrays in ascending order – Arrays in descending order – Square root of a number.

UNIT IV

Single chip microcontrollers – Intel 8051 series microcontrollers(MCS -51) – MCS 151 and MCS 251 high performance CHMOS microcontrollers – Intel 8096 series microcontrollers (MCS 96) – Brief description of Intel 8096 family members – 32 bit microcontrollers – Rupi44 family microcontroller with on-chip communication controller – I/O processor – Co-processor.

UNIT V

Microprocessor applications – Speed of motor – Stepper motor – Traffic control – 8086 – operating modes – Status flags – Registers – Addressing modes – 8086/8088 CPU architecture – Execution unit – general registers – arithmetic and logic unit – flag registers – Bus interface unit – instruction queue – instruction pointer – segment registers.

TEXT BOOKS:

1. Microprocessor and its applications ,B. Ram, Dhanpat Rai Publications Ltd.,1993(IVth edition)
Unit I Ch. 1.1, 5.1 to 5.3; 1.6, 1.7, 1.10 to 1.23, 3.1 ;
Unit II Ch. 3.2, 3.3, 4.1 to 4.3, 5.5, 5.63;
Unit III Ch. 6.1 to 6.3, 6.5, 6.6, 6.10, 6.12, 6.21, 6.24, 6.22, 6.36;
2. Advanced Microprocessors and Interfacing, Badri Ram, 2001, Tata McGraw Hill Publishing Ltd , New Delhi. ISBN – 0-07-043448-4
Unit IV Ch. 6.1, 6.3 and 6.4
3.8085 Microprocessor programming and interfacing, N.K.Srinath, 2012, PHI learning private limited, New Delhi
Unit V Ch.13

REFERENCE BOOK .

1.Introduction to Microprocessors, Aditya P. Mathur Tata Mc Graw Hill Ltd., New Delhi, 2nd Editon 1985.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PP1**
Semester : IV **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

SPECTROSCOPY

COURSE OBJECTIVES:

- To present the fundamental aspects of major areas of spectroscopy.viz., Infra red, Raman and NMR.
- Basic concepts and instrumentation techniques are discussed in detail.
- To provide necessary foundation for proceeding over to the elucidation of structural information of complex molecules from their spectra.

UNIT I INFRARED SPECTROSCOPY

Energy of a diatomic molecule – simple harmonic oscillator – Anharmonic oscillator – diatomic vibrating rotator – vibrations of polyatomic molecules – fundamental vibrations and their symmetry – influence of rotations on the spectra of polyatomic molecules – linear molecules – symmetric top molecules – skeletal vibrations-group frequencies-techniques and instrumentation – double and single beam operation.

UNIT II RAMAN SPECTROSCOPY

Pure rotation Raman spectra – linear molecules – symmetric top molecules – vibrational Raman spectra – Raman activity of vibrations – rules of mutual exclusion overtone and combination – vibrational Raman spectra – rotational fine structure – nature of polarized light – vibration of spherical top molecules – techniques and instrumentation- the Fourier transform spectroscopy.

UNIT III ELECTRONIC SPECTROSCOPY OF MOLECULES

Electronic spectra of diatomic molecules- the Born-Oppenheimer Approximation vibrational Coarse Structure: Progressions- intensity of Vibrational-Electronic Spectra: the Franck-Condon Principle- Rotational fine structure of electronic-vibration transitionselectronic spectra of polyatomic molecules- change of shape of excitation-chemical analysis by electronic spectroscopy-the Re-emission of energy by an excited moleculetechniques and instrumentation-molecular photoelectron spectroscopy-Ultra-violet photoelectron spectroscopy-X-ray photoelectron spectroscopy

UNIT IV NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

The nature of spinning particles – Interaction between spin and a magnetic field – population of energy levels – Larmor precession and relaxation time – Fourier Transform spectroscopy in NMR – Chemical shift.

UNIT V ELECTRON SPIN RESONANCE SPECTROSCOPY

Introduction- position of E.S.R absorptions: the g-factor-hyperfine structure of E.S.R absorptions- double resonance in E.S.R- fine structure in E.S.R spectra- technique of E.S.R spectroscopy

TEXT BOOK:

Fundamentals of molecular spectroscopy, c.n. Banwell, e. M. Mccash, tata mcgraw-hill publishing company limited, new delhi.

REFERENCE BOOKS:

1. Molecular structure and spectroscopy, G. Aruldhas, Prentice-Hall of India private Limited, New Delhi.
2. Molecular spectroscopy, P. S. Sindhu, Tata McGraw-Hill publishing company Limited, New Delhi.
3. Introduction to Molecular Spectroscopy, G.M. Borrow, McGraw-Hill Kogakusha Ltd, Tikyo. (for unit V)

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PP2**
Semester : IV **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

NANO SCIENCE

COURSE OBJECTIVE:

- To enable the student understand the postulates and concepts of nanophysics with clarity.
- To help the students understand the principles, fabrication and design of Carbon Nano-Tubes and their application.
- To expose the students to the theoretical and experimental aspects of quantum wells, wires and dots.
- To introduce the student to the techniques of nanomachines and nanodevices.

UNIT I INTRODUCTION TO PHYSICS OF THE SOLID STATE AND PROPERTIES OF INDIVIDUAL NANO PARTICLES

Size dependence of Properties - Crystal structure – Face-centered cubic nanoparticles - Tetrahedrally bonded semiconductor crystals - Lattice vibrations. Metal Nanoclusters: Magic Numbers-Theoretical Modeling Of Nanoparticles-Geometric Structure-Electronic Structure-Reactivity Fluctuations-Magnetic Clusters-Bulk To Nanotransition, Semiconducting Nanoparticles: Optical Properties- Photofragmentation- Coulombic Explosion

UNIT II CARBON NANOSTRUCTURES

Introduction – Carbon Molecules – Nature of the Carbon bond – New Carbon Structures – Small Carbon Clusters – Discovery of C60 Structure of C60 and its Crystal – Alkali doped C60 – Superconductivity in C60 Larger and Smaller Fullerenes – Other Buckyballs – Carbon nanotubes – Fabrication – Structure – Electric Properties – Vibrational Properties – Mechanical Properties.

UNIT III NANOSTRUCTURED FERROMAGNETISM

Basics of Ferromagnetism – Effect of Bulk Nanostructuring of Magnetic Properties – Dynamics of Nanomagnets – Nanopore containment of Magnetic particles – Nanocarbon Ferromagnets – Giant and Colossal Magnetoresistance – Ferrofluids.

UNIT IV APPLICATION OF CARBON NANOTUBES & QUANTUM WELLS, WIRES, AND DOTS

Field Emission and Shielding – Computers – Fuels – Chemical Sensors – Catalysis – Mechanical Reinforcement. Quantum Wells, Wires and Dots: Preparation of Quantum nanostructures – Size and Dimensionality Effects – Excitons – Single Electron Tunneling – Applications – Infrared Detectors – Quantum Dot Lasers – Superconductivity.

UNIT V NANOMACHINES AND NANODEVICES

Microelectro mechanical systems (MEM) – Nanoelectromechanical Systems (NEMS): Fabrication – Nanodevices and Nanomachines – Molecular and Supramolecular Switches.

TEXT BOOK :

Introduction to Nanotechnology: Charles P. Poole Jr & Frank J. Owens, Wiley India II reprint, 2011.

REFERENCE BOOK:

Nano Technology, Richard Booker & Earl Baysen, wiley (2005).

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PP3**
Semester : IV **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 4**

OPTICAL COMMUNICATION AND NETWORKING

COURSE OBJECTIVE:

- To give an exposure to various types of fibers.
- To study the transmission characteristics of optical fibers.
- To know the sources and detectors; function of networks etc.,

UNIT I OPTICAL FIBER MODES

:-Fiber types-rays and modes-Step index fiber structure-Ray optics representation –Mode theory for circular waveguides-Key modal concepts-cutoff wavelength and v number-wave equation for step index fiber-modes in step index fibers-single mode fibers-propagation modes in single mode fiber-graded index fiber-core index-graded index numerical aperture-cutoff condition in graded index fibers

UNIT II ATTEUNATION AND DISPERSION

Attenuation– Attenuation units- absorption- scattering losses-Bending losses- core and clasdding losses- signal dispersion in fibers-overview of dispersion origins –factors contributing to dispersion-Material Dispersion –Waveguide dispersion – dispersion in single mode fibers.

UNIT III SOURCES AND DETECTORS

Optical sources: Light Emitting Diodes - LED structures – light source materials - quantum efficiency and LED power - laser diodes – laser diode modes and threshold conditions – external quantum efficiency - Optical Detectors: PIN Photo detectors - Avalanche photo diodes - Photo detector noise – Noise sources , Signal to Noise ratio

UNIT IV FIBER OPTIC RECEIVER, MEASUREMENTS AND AMPLIFIERS

Fundamental receiver operation – digital signal operation – error sources – front end amplifier – digital reciver performance – probability of error – receiver sensitivity – quantum limit – eye diagram – eye pattern features – BER and Q-factor measurements – burst mode receivers – analog receivers – Optical amplifiers – basic applications and types of optical amplifiers – general applications – amplifier types – Erbium doped fiber amplifiers – amplification mechanism - EDFA architecture – amplifier noise – optical SNR.

UNIT V OPTICAL NETWORKS

Optical Networks - network concepts – network terminology – network categories – network layers – optic layers - SONET / SDH Transmission formats and speeds – Optical interfaces – SONET / SDH – RINGS - SONET / SDH networks - Optical switching – optical cross connect – wavelength conversion – wavelength routing – optical packet switching – optical burst switching - WDM Network examples – wideband Long-haul WDM Networks – Narrow band metro WDM Networks

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser – Mc Graw Hill – Fifth Edition**.** 2013 ISBN-13: 978-1-25-900687-6; ISBN-10: 1-25-900687-5

REFERENCE BOOKS:

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition.2007
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001
3. Rajiv Ramaswami, "Optical Networks " , Second Edition, Elsevier , 2004.
4. Govind P. Agrawal, " Fiber-optic communication systems", third edition, John Wiley & sons, 2004.
5. R.P. Khare, "Fiber Optics and Optoelectronics", Oxford University Press, 2007.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PPE3(X)**
Semester : IV **No. of hrs. allotted : 5**
Paper : Elective **No. of credits : 5**

X-RAY CRYSTALLOGRAPHY

COURSE OBJECTIVES:

- To introduce the theoretical and experimental aspects involved in X-ray diffraction by single crystals.
- To enable the students understand the relationship between symmetry and scattering of X-rays.
- To help students understand the applications of crystallography to study the structures of small molecules and complex biological macromolecules such as proteins.

UNIT I CRYSTALS & SYMMETRY

Crystal shapes and habit – Unit cell – Crystal systems – Bravais lattice – Symmetry elements – Point group – Space group (P2, P21, P212121, Pbca, P21/c, Pmmm, Pna21, C2) – Standard and Non-standard settings – Enantiomorphs

UNIT II DIFFRACTION OF X-RAYS AND EXPERIMENTAL METHODS

Braggs law – Miller indices – Concepts of real & reciprocal lattice – Ewald & limiting spheres – Scattering by an electron – Scattering by an atom – Scattering by a crystal – Structure factor – Systematic absences – Laue – Rotation/oscillation – Weissenberg techniques – The powder method – Recent techniques of experimental data collection.

UNIT III FACTORS AFFECTING X-RAY INTENSITIES

Lorentz and polarization factors – Absorption of X-rays – Primary extinction – Secondary extinction – Temperature factor – Anomalous scattering – Break down of Friedel's law.

UNIT IV CRYSTAL STRUCTURE DETERMINATION

Trial and error method – Phase problem – Fourier synthesis – The Patterson function – The heavy atom method – Isomorphous replacement – Inequality relationship – Sign relationships – Phase relationships – Absolute configuration – Conformational analysis – Hydrogen bonds – Structural databases.

UNIT V PROTEIN CRYSTALLOGRAPHY

Amino acids – Hydrophobic and hydrophilic amino acids – Peptides – Peptide bond – Ramachandran map – Proteins – Unit cell size – Molecular Weight determination – Structural organization of proteins – □-helix – □-sheet – □-strands – □-barrel – turns and loops – Protein folding – Data collection methods – Resolution of data – Space group frequencies – Structure solution methods – Structure-function relationships – Protein Data Bank.

TEXT BOOKS:

1. X-ray Diffraction – Its theory and Applications S.K. CHATTERJEE :, Prentice-Hall, New Delhi, 1999. (For Units I ,II, III & IV)
2. An Introduction to X-ray Crystallography M.M.WOOLFSON :, Cambridge University Press-Vikas Publishing House, New Delhi, 1980. (For Units III IV relevant pages)
3. Essentials of Biophysics, P. NARAYANAN: New Age International Publishers, New Delhi, 1998. (For Unit V).

REFERENCE BOOKS:

1. X-ray Structure Determination – A Practical Guide :G.H. STOUT & L.H. JENSEN, John Wiley & Sons, New York, 1989.
2. Crystal Structure Analysis – A Primer , J.P. GLUSKER & K.N. TRUEBLOOD, II ed. Oxford University Press, New York, 1985.
3. Elements of X-ray Diffraction, B.D. CULLITY, Addison-Wesley, 1956

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PPE3(A)**
Semester : IV **No. of hrs. allotted : 5**
Paper : Elective **No. of credits : 5**

ASTROPHYSICS

COURSE OBJECTIVES:

- To explain to the students the methods of collecting stellar data and how they are used in classifying the stars.
- To journey into the life of a star from its birth till its death.
- To discuss in elaboration the Astronomical Instruments.

UNIT I FUNDAMENTALS

Identification of stars – Spherical coordinates – The Altazimuth system – The local equatorial system – The Universal equatorial system – Conversion of coordinates – Magnitude scale – Measurement of apparent luminosity – Various magnitude systems – Corrections for observed magnitudes – Meausrement of terrestrial distances – Measurement of distances within the solar system – Trigonometric parallaxes of stars – Gemoetrical methods – The method of luminosity distance.

UNIT II STARS

Laws for radiation in thermodynamic equilibrium – Application of radiation law to stellar photospheres – Defining temperatures of stars by matter waves – Spectral classification of stars – Explanation of MK spectra – Peculiar stellar spectra – Kepler's third law – Binary stars – Discription of a binary system – Visual binaries – Spectroscopic binaries – Eclipsing binaries – Stellar radii – Important relations between stellar parameters.

UNIT III INTERNAL STRUCTURE OF STARS

Equation of stellar structure – Polytropic models – Temperature distribution in polytropes – Stellar energy sources – Stellar opacity – Preliminary models of main sequence stars – Models of real stars – Structure of white dwarfs.

UNIT IV STELLAR EVOLUTION

The virial theorem – Evolution near the main sequence – Star formation – Pre-main sequence contraction – Post-main sequence evolution – Nucleosynthesis – Superdense remnants – Evolution of close binary systems.

UNIT V ASTRONOMICAL INSTRUMENTS AND SPACE ASTRONOMY

Astronomical Instruments: Optical telescopes – Optical photometric instruments and techniques – Optical spectroscopy – Radio telescopes – Infrared Astronomy – Space Astronomies : Infrared Astronomy – Ultraviolet Astronomy – X-ray Astronomy – Gamma ray Astronomy – The Hubble space telescope.

TEXT BOOK:

Astrophysics : Stars and Galaxies Abhyankar, K.D., , University Press, 2007, ISBN:8173713812.

REFERENCE BOOK:

Fundamentals of Astronomy ,Barbieri, C., , Taylor & Francis, 2007, ISBN: 0750308869.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF PHYSICS

(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PPL1**

Semester : I & II **No. of hrs. allotted: 5**

Paper : Lab **No. of credits : 5**

GENERAL EXPERIMENTS

1. Elastic constants by Newton's rings
2. Thermal expansion by Newton's rings
3. G.M.Counter
4. Quincke's method
5. Gouy' method
6. M-H hysteresis
7. Error analysis and least squares –Programming
8. Least squares for the leakage resistance of a capacitor
9. Faraday optic rotation
10. Ultrasonics- solids
11. Ultrasonics- liquids
12. Dielectric constant and phase transition
13. Spectrum calibration
14. Refractive index using abbes refract meter and hollow prism
15. Hall coefficient
16. Elliptical Fringes
17. Hyperbolic Fringes
18. Four probe method (Band energy gap)
19. Hartmann's interpolation formula (using powder spectrum)
20. Hartmann's interpolation formula (using spectrometer)
21. Comparison of wavelengths using CDS and spectrometer
22. Interpretation of powder photograph
23. Indexing a zero layer Weissenberg photograph
24. Fraunhoffer diffraction using Laser
25. Millikan's Oil drop expt.
26. Optic bench-biprism

Each experiment is planned for 9 hrs and each of this experiment can be divided into many number depending on the hours of work

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 2PPL2**
Semester : I & II **No. of hrs. allotted : 5**
Paper : Lab **No. of credits : 5**

ELECTRONICS EXPERIMENTS

1. 741 amplifiers
2. 741 oscillators
3. 555 multivibrators
4. Series and shunt regulation with Zener
5. Regulated power supply with 7805 & 7812
6. 7400 and 7402 gates
7. Analog computation
8. Shift register
9. Decade counter
10. Encoder and decoder
11. Multiplexer and demultiplexer
12. Differentiating, Integrating RC filter
13. Two Stage Amplifier with feedback
14. Two Stage Amplifier without feedback
15. Characteristics (UJT and SCR)
16. FET Amplifier
17. Phase shift oscillator
18. Amplitude modulation
19. Dual power supply
20. Oscillator(Hartley and colpitt)

Each experiment is planned for 9 hrs and each of this experiment can be subdivided depending on the hours of work

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : 4PPL1**
Semester : III & IV **No. of hrs. allotted : 5**
Paper : Lab **No. of credits : 6**

ADVANCED EXPERIMENTS

1. Filters (I order, II order Low and high pass filters, Band pass filters)
2. Study of JK Flip-Flop.
3. Synchronous counter to count any desired sequence.
4. Shift Register (SISO, PIPO)
5. Half Adder, Full Adder, Half Subtractor, Full Subtractor.
6. Karnaugh map simplification
7. Differentiator, Integrator, Comparator, Triangular wave generator.
8. BCD to seven segment display.
9. Simultaneous equation
10. Schmidt Trigger (using 555)
11. UJT relaxation oscillator.
12. Fibre optic communication
13. MICROPROCESSOR
    1. Microprocessor problems for 8 bit addition
    2. Microprocessor problems for 8 bit subtraction(binary)
    3. Microprocessor problems for 8 bit subtraction(decimal)
    4. Microprocessor problems for 8 bit multiplication(binary)
    5. Finding a largest number in an array of data
    6. Finding a smallest number in an array of data
    7. Sorting an array of data in ascending order
    8. Sorting an array of data in descending order
    9. Finding 1's complement of data
    10. Finding 2's complement of data
    11. Microprocessor with interfacing
14. C and C ++ programming and MS EXCEL- Relevant programmes

Each experiment is planned for 9 hrs and each of this experiment can be divided into many number depending on the hours of work

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-16 batch onwards)

Course : M.Sc. Physics **Code : PJ1**
Semester : III & IV **No. of hrs. allotted : 5**
Paper : Core **No. of credits : 7**

PROJECT

Individual projects done by the students under the guidance of faculty members.

M.Phil Physics

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

M.Phil Physics

COURSE STRUCTURE (w.e.f 2014 -15batch onwards)

Semester – I

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
CORE	1SMP1	Elements of Research Methods in Physics	6	6	90	100	100	200
CORE	1SMP2	Advanced Physics	6	6	90	100	100	200

Semester – II

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
*Core Elective	2SMPE1	Elective	6	6	Nil*	100	100	200
Core	2SMP2	Dissertation & Viva-Voce	-	6	-	100	100	200

List of Elective Papers

- Spectroscopy -2SMPE1(S)
- Thin Films -2SMPE1(T)
- X-Ray Crystallography -2SMPE1(X)
- Ultrasonics -2SMPE1(U)

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil. Physics **Code : 1SMP1**
Semester : I **No. of hrs. allotted : 6**
Paper : Core **No. of credits : 6**

ELEMENTS OF RESEARCH METHODS IN PHYSICS

COURSE OBJECTIVE:

This paper aims at exposing the students to the fundamental principles and concepts involved in the methods of research in Physics

UNIT I ELEMENTS OF CRYSTALS

Symmetry of crystals : Modes of repetition – Symmetry elements – Classification of crystals – Notation of crystal faces – Projection of crystals : Perspective projections – Gnomonic projection – Stereographic projection

UNIT II SYMMETRY

Symmetry in nature – Symmetry in a molecule – Symmetry elements – Various types of symmetry operations – Point groups – Properties of point groups – Determination of the point group of a molecule – Representations of Groups – The character – Character table for point groups.

UNIT III ANALYTICAL METHODS

UV-Vis spectroscopy: Fundamental laws of photometry, deviations from Beer's law - **IR spectroscopy:** Introduction, correlation of IR spectra with molecular structure, instrumentation, sample handling - **Raman spectroscopy:** theory, resonance Raman spectroscopy, instrumentation, sampling techniques - **NMR spectroscopy:** Basic principles, pulsed Fourier transform NMR spectrometer – **Thermal analysis:** DSC and DTA - instrumentation, thermogravimetry, methodology of TG, DSC and DTA.

UNIT IV QUANTUM CHEMICAL COMPUTATIONS

Fundamental principles: energy, electrostatics, atomic units, thermodynamics, quantum mechanics, statistical mechanics, Hartree - Fock approximation, semiempirical methods, density functional theory: basic theory, linear scaling techniques, practical considerations.

UNIT V NON-DESTRUCTIVE TESTING

Liquid penetrant testing- principle – testing methods- – Radiography – principles- Inspection techniques- Ultrasonic testing principle- pulse-echo and through transmission technique- Ultrasonic flaw detector- Acoustic emission testing – principle- instrumentation.

TEXT BOOKS:

1. L. V. Azaroff, Elements of X-ray Crystallography, McGraw Hill, 1968. **[Unit I]**
2. A. K. Chandra, Introduction to Quantum Chemistry (3rd ed.), Tata McGraw Hill,1988. **[Unit II]**
3. H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, Instrumental methods of analysis (7^{th} ed.), CBS Publishers & Distributors, 1986. **[Unit III]**
4. D. C. Young, Computational chemistry: A practical guide for applying techniques to real-world problems, John Wiley & Sons, Inc, 2001. **[Unit IV]**
5. Baldevraj, T. Jayakumar, M. Thavasimuthu, Practical Non-Destructive Testing (3^{rd} ed.), Narosa publishing house, 2007. **[Unit V]**

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil. Physics **Code : 1SMP2**
Semester : I **No. of hrs. allotted : 6**
Paper : Core **No. of credits : 6**

ADVANCED PHYSICS

COURSE OBJECTIVE:

To provide necessary theoretical knowledge in some of the major areas of research in materials science

UNIT I BASIC QUANTUM CONCEPTS OF NANO STRUCTURES:

Heterostructures – General properties and growth of hetero structures – Band engineering Doped heterostructures – Wires and dots – Optical confinement

UNIT II CHARACTERIZATION, PROPERTIES AND APPLICATIONS OF NANO MATERIALS.

Introduction, structure characterization, chemical characterization, physical properties of nano materials, electrical conductivity, ferroelectrics and dielectrics, super paramagnetism.

UNIT III THIN FILMS

Introduction, fundamentals of film growth, vacuum science, physical vapor deposition, chemical vapor deposition, atomic layer deposition, Langmuir-Blodgett films, Electrochemical deposition, Sol-gel films.

UNIT IV DIELECTRIC STUDIES

Theory of dielectric relaxation: Introduction, electrostatics, Debye relaxation, models for non-Debye ralaxation - **Dielectric measurement techniques:** Introduction, measurements in the frequency domain from 10^{-6} Hz to 10^{11} Hz, Fourier correlation analysis, Dielectric converters in combination with Fourier correlation analysis, Impedance analysis, Network analysis, impedance and frequency ranges overview, measurement systems in the time domain from 10^{-6} Hz to 10^{10} Hz.

UNIT V SOLAR CONCENTRATING COLLECTORS AND ENERGY STORAGE.

Focusing Type – parabolic Type – non-focusing type – compound parabolic concentration – Performance analysis of a cylindrical parabolic concentrating collector – Selective absorber coating – Solar thermal storage – Solar pond- Construction and operation of Solar pond.

TEXT BOOKS:

1. The Physics of low dimensional semiconductors , Hohn H. Davies, Cambridge University Press (1998) (Unit I)
2. H. Gao, Nano structures & nanomaterials, Imperial college press, 2004. **(Unit II & III)**
3. F. Kremer, A. Schonhals (Eds.), Broadband dielectric spectroscopy, Springer verlag, Berlin, 2002. **(Unit IV)**
4. G. D. Rai, Non-conventional Energy Sources, Khanna Publishers, 1997**. (Unit V)**

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil. Physics **Code : 2SMPE1(S)**
Semester : II **No. of hrs. allotted :**
Paper : Elective **No. of credits : 6**

SPECTROSCOPY

COURSE OBJECTIVE:

To provide necessary foundation for proceeding over to the elucidation of structural information of complex molecules from their spectra.

UNIT I INFRARED SPECTROSCOPY

Units of frequency, wavelength and wavenumber, molecular vibration: calculation of vibrational frequencies, modes of vibration, quantum restrictions, factors influencing vibrational frequencies, absorbance and transmittance scale, applications of infrared spectroscopy: identity by fingerprinting and identification of functional groups.

UNIT II NMR SPECTROSCOPY

Proton NMR: The NMR phenomenon, theory of nuclear magnetic resonance, chemical shift and its measurement, internal standards, units used in NMR spectroscopy, the splitting of NMR signals in proton NMR spectra, theory of spin-spin splitting, magnitude of the coupling - coupling constants.

UNIT III ULTRAVIOLET AND VISIBLE SPECTROSCOPY

The chromophore concept, theory of electronic spectroscopy: orbitals involved in electronic transitions, Beer's and Lambert's law, conventions, instrumentation and sampling, solvents and solutions, solvent effects.

UNIT IV MASS SPECTROMETRY

Basic principles, instrumentation: sample insertion - inlet systems, ion production in the ionization chamber, separation of ions in the analyzer, the detector - recorder, data handling, isotope abundances, the molecular ion: structure of the molecular ion, recognition of the molecular ion, molecular formula from the molecular ion, metastable ions: the nature of metastable ions, ion tube regions. calculation of metastable ion $\frac{m}{z}$ values.

UNIT V PHOTOACOUSTICS

History of Photoacoustics – prehistory and modern history -Theory of PAS of gases – absorption of light – excitation of acoustic wave – energy transfer physics - Rosencwaig - Gersho theory – special cases – experimental verification – photoacoustic transport in a fluid.

TEXT BOOKS:

1. W. Kemp, Organic spectroscopy (3rd ed.), Macmillan press Ltd., 1991. **(Units I - IV)**
2. A. Rosencwaig, Photoacoustics and Photoacoustic spectroscopy, John Wiley, 1980. (Unit V)

REFERENCE BOOKS:

1. B.P. Straughan, S. Walker, Spectroscopy [Vol. II], John Wiley & Sons, New York, 1996.
2. G. Aruldhass, Molecular structure and spectroscopy (2nd ed.), Prentice – Hall of India, 2007.
3. C. N. Banwell, E. M. McCash, Fundamentals of spectroscopy, Tata McGraw-Hill, 2000.

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil. Physics **Code : 2SMPE1(T)**
Semester : II **No. of hrs. allotted :**
Paper : Elective **No. of credits : 6**

THIN FILMS

COURSE OBJECTIVE:

- To know about the fabrication of thin films.
- To impart the knowledge about the instruments used for characterization of thin films.

UNIT I FABRICATION OF THIN FILMS

Film thickness uniformity and purity – Evaporation hardware and techniques – Glow discharges and plasmas – Sputtering – Sputtering processes – Hyrbrid and modified PVD processes – Chemical vapour deposition: Reaction types – Thermodynamics of CVD – Gas transport – Growth kinetics – CVD processes and systems.

UNIT II CHARACTERIZATION OF THIN FILMS

Film thickness: Optical and mechanical methods for measuring film thickness – Structural characterization : Scanning electron microscopy (SEM) – Transmission electron microscopy (TEM) – X-ray diffraction – Chemical characterization : Electron spectroscopy – X-ray Energy-Dispersive Analysis (EDX) – Auguer electron spectroscopy (AES) – X-ray photoelectron spectroscopy (XPS) – Rutherford backscattering (RBS) – Secondary Ion Mass Spectrometry.

UNIT III EPITAXY

Structural aspects of epitaxial films – Lattice misfit and imperfections in epitaxial films – Epitaxy of compound semiconductors – Methods for depositing epitaxial semiconductor films – Epitaxial film growth and characterization.

UNIT IV MECHANICAL AND OPTICAL PROPERTIES

Elasticity, Plasticity and Mechanical behavior of thin films – Internal stresses and their analysis – Stress in thin films – Relaxation effects in stressed films – Adhesion – Properties of optical film materials – Thin film optics – Multilayer optical film applications.

UNIT V ELECTRICAL AND MAGNETIC PROPERTIES

Electrical properties of thin films – Conduction in Metal films – Electrical transport in insulating films – Semiconductor contacts and MOS structures – Superconductivity in thin films – Ferromagnetism – Magnetic film size effects vs. thickness and temperature – Magnetic thin films for memory applications.

TEXT BOOKS:

1. Ohring, M., The Materials Science of Thin Films, Academic Press, 1992.
2. Chopra, K.L., Thin film Physics, Tata McGraw Hill, 1996.
3. Granquist, G., A Handbook of inorganic materials, ElsevierPublication,Amsterdam, 1998.
4. Willard, Meritt, Dean J.A. Settle, F.A., Instrumentation methods of analysis VI CBS published, 1986, India.Progress in intercalation Research, Kluwar Academic Publishes Dordlechet/London & Boston, Edited by W. Muller-Warmuth & R.Schollhorn.
5. Goswamy, Thin film fundamentals, New Age International, New Delhi – 1996.

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil Physics **Code : 2SMPE1(X)**
Semester : II **No. of hrs. allotted :**
Paper : Elective **No. of credits : 6**

X-RAY CRYSTALLOGRAPHY

COURSE OBJECTIVE:

To enable students understand the principles involved in the application of X-ray crystallography to study the structure of crystals

UNIT I GEOMETRY OF THE CRYSTALLINE STATE

The general features of crystals – The external symmetry of crystals – The seven crystal systems – The thirty-two crystal classes – The unit cell – Miller indices – Space lattices – The reciprocal lattice – Symmetry elements – Space groups – Space group and crystal class.

UNIT II X-RAY DIFFRACTION DATA

Conditions for diffraction to occur – Diffractometers – X-ray sources – Image plate systems– Diffraction from a rotating crystal

UNIT III FACTORS AFFECTING X-RAY INTENSITIES

Absorption of X-rays – Primary extinction – Secondary extinction – The temperature factor – Anomalous scattering – Tests for lack of a centre of symmetry – The symmetry of X-ray photographs – Systematic absences – Detection of mirror plans and diad axes.

UNIT IV DETERMINATION OF CRYSTAL STRUCTURES

Trial and error methods – The Patterson function – The heavy-atom method – sIsomorphous replacement – The application of anomalous scattering – Direct methods: Inequality relationships – Sign relationships – General phase relationships.

UNIT V REFINEMENT AND ANALYSIS OF STRUCTURE

Absolute configuration – Conformational analysis – Hydrogen bonds – Cambridge Structural Database – WinGX : An Integrated System of Windows Programs for the Solution, Refinement and Analysis of Single Crystal X-ray Diffraction Data – The Rietveld technique.

TEXT BOOKS:

1. Woolfson, M.M., *An Introduction to X-ray Crystallography* (II ed.), Cambridge University Press, **1997**. ISBN 0-521-42359-7
2. Ladd, M.F.C. & Palmer, R.A., *Structure Determination by X-ray Crystallography* (IV Ed.), Springer, **2003**.
3. Pattabhi, V. & Gauttham, N., *Biophysics*, Kluwer Academic Publishers, **2002**. Rhodes, G, *Crystallography Made Crystal Clear: A Guide for Users ofMacromolecular Models* (III ed.), Elsevier, **2006**
4. 5.Stout, G.H. & Jensen, L.H., *X-ray Structure Determination – A Practical Guide*, JohnWiley & Sons, **1989**.
5. Glusker, J.P. & Trueblood, K.N., *Crystal Structure Analysis – A Primer* (II ed.), Oxford University Press, **1985**. ISBN 0-19-503543-7.

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DEPARTMENT OF PHYSICS
(From 2014-15 batch onwards)

Course : M.Phil. Physics **Code : 2SMPE1(U)**
Semester : II **No. of hrs. allotted :**
Paper :Elective **No. of credits : 6**

ULTRASONICS

COURSE OBJECTIVE

- To Understand the basic concept of ultrasonics
- To Know the generation and transducers of ultrasonics
- To acquire the measurement techniques of ultrasound
- To study the application of ultrasonic in liquids and solid systems.

UNIT I FUNDAMENTALS OF ULTRASONICS

Ultrasonic waves – Different modes of ultrasonic waves- Characteristic properties of ultrasonic waves- behaviour of ultrasonic waves - reflection and transmission at normal incidence, mode conversion, critical angle and attenuation.

UNIT II ULTRASONIC GENERATIONS AND TRANSDUCERS

Ultrasonic generation- mechanical method- magnetostrictive method- piezoelectric method- transducer materials- types of transducers- normal beam, twin crystal and angle beam transducer.

UNIT III MEASUREMENT TECHNIQUES OF ULTRASOUND

Pulse technique- sing around method- pulse superposition method- pulse echo overlap method- cross-correlation method- direct method- attenuation measurement methods.

UNIT IV ULTRASONIC STUDY OF LIQUID MIXTURES

Types of molecular interactions- ultrasonic study of molecular interactions- preparation of multi component liquid mixtures- measurement techniques- behaviour of ultrasonic waves in pure liquids, mixtures and gases- theories of ultrasonic velocity in mixtures and solutions- acoustical parameters obtained from velocity and other data.

UNIT V ULTRASONIC NON-DESTRUCTIVE TESTING

Classification of ultrasonic testing- pulse echo and through transmission method- different types of technique in pulse echo method- ultrasonic flaw detector- types of scan- A, B and C scan techniques- ultrasonic inspection of welds by angle beam probes- synthetic aperture focussing technique- time of flight diffraction technique.

TEXT BOOK:

Science and technology of ultrasonic- Baldev Raj, V.Rajendran and P.Palanichamy,
Narosa Publishing House, New Delhi (2004). ISBN 81-7319-202-2.

REFERENCE BOOKS:

1. Practical Ultrasonics- C.V.Subramanian, Narosa Publishing House, New Delhi 2011, ISBN 978-81-7319-646-1.
2. Practical Non-destructive testing- Baldev Raj, T.Jayakumar and T.Thavasimuthu, Narosa Publishing House, New Delhi 2007. ISBN 978-81-7319-797-0..
3. Ultrasonic methods and applications, by J. Blitz Butter worth Public.& co 1971

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF PHYSICS

(From 2014 – 2015 Batch onwards)

Course : B.Sc. **Code :**

Semester : **No. of hrs. allotted :**

Paper : CERTIFICATE **No. of credits :**

CRYSTAL PHYSICS - I

COURSE OBJECTIVES:

- To understand fundamentals of solid structure of materials.
- To give exposure to different techniques of XRD.

UNIT – I INTRODUCTION

An introduction to crystallography – Scope- Potential – Application of X- rays -Structure of Crystals – Classification of Crystals – Diffraction of X-rays – Laue - Powder – Single Crystal Methods – Moving crystal and moving film methods – The Rotation method – Diffractometers.

UNIT – II RECIPROCAL LATTICE

The reciprocal lattice – Fundamental laws of reciprocal lattice – Calculation of structure factor - Determination of Debye-Waller factors and Debye temperature using observed intensities - Close packed structures – Voids in close packed structures – Symmetry and Space group – Miller indices

UNIT – III X-RAY DIFFRACTION

Diffraction conditions in the reciprocal lattice – Examples of close packed structures - Elements – Inorganic structures – Anomalous dispersion of X-rays - Dispersion correction terms - Fluorescence – Use – Absorption of X-rays – Absorption corrections.

UNIT – IV CRYSTAL GROWTH

The fundamentals of crystal growth – Slow evaporation method – Quality of grown crystals – Gel technique – High temperature methods – Bridgmann method – CZ method.

UNIT – V EXPERIMENTAL TECHNIQUES

Preparation of samples for data collection. – Measurement of density of crystals – Determination of cell parameters – Interpretation of Oscillation photograph – Weissenberg photograph – Laue photograph – Powder Photograph - Determination of dislocation densities – Etch pit measurements.

TEXT BOOKS:

1. Introduction to Solid State Physics (VII ed.) ,Kittel, C. :, John Wiley & Sons, 1996. ISBN : 81 – 265 – 1045 – 5.
2. Elements of X-ray Crystallography – L.V.Azaroff.
3. Crystal Growth – Processes and Methods – P. Santhana Raghavan & P.Ramasamy.

REFERENCE BOOK :

An introduction to X-ray Crystallography , M.M.Woolfson.

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DEPARTMENT OF PHYSICS

(From 2014 – 2015 Batch onwards)

DIPLOMA IN WEB DESIGNING

Course : M.Sc., Physics Code :
Class : I Year No of Hrs allotted :60
Semester : I & II No of credits :
Title of the Paper: Web Designing

Unit – I

Introduction to the Internet and Internet Technologies

Computers in Business – Networking – Internet – Electronic Mail (E-Mail) – Resource Sharing – Gopher – World Wide Web – Usenet – Telnet – Bulletin Board Service – Wide Area Information service – Modem – Internet Addressing – Physical Connections – Telephone Lines.

Unit – II

Internet Browsers and Introduction to HTML

Internet Explorer – Netscape Navigator – Designing a Home page – History of HTML – HTML Generation – HTML Documents – Anchor Tag – Hyper Links – Sample HTML Documents.

Unit – III

Head and Body Sections and Designing the Body Section

Header Section – Title – Prologue – Links – Colorful Web Page – Comment Lines – Some Example HTML Documents – Heading Printing – Aligning the Heading – Horizontal Rule – Paragraph – Tab Settings – Images and Pictures – Embedding PNG Format Images.

Unit – IV

Ordered and Unordered Lists and Table Handling

List – unordered List – Heading in a List – Ordered Lists – Nested Lists – Tables – Table Creation in HTML – Width of the Table and Cells – Cells Spanning Multiple Rows / Columns – Coloring Cells – Column Specification – Some Sample tables

Unit – V

DHTML and Style Sheets and Frames

Defining Styles – Elements of Styles – Linking a Style Sheet to an HTML Document – In – Line Style – External Style Sheets – Internal Style Sheets – Multiple Styles – Frameset Definition – Frame Definition – Nested Framesets.

Text Books:

Title **:** World Wide Web Designing with HTML
Author : C.Xavier
Publisher : Tata McGraw Hill
Year : reprint 2010

Chapters(Relevant Topics Only)

Unit – I : 1,2
Unit- II : 3,4
Unit- III : 5,6
Unit- IV : 7,8
Unit – V : 9,10