RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)

(Re-accredited with A Grade by NAAC)

THANJAVUR - 613 005.

PG and Research Department of Physics

Board of Studies: 2018-2019

(Under CBCS Pattern)

[For the Candidates admitted from 2018 -2019 onwards]

PG AND RESEARCH DEPARTMENT OF PHYSICS
RAJAH SERFOJI GOVERNMENT COLLEGE (Autonomous)
THANJAVUR 613005

BOARD OF STUDIES MEETING
18.04.2018

The meeting of Board of Studies (BoS) in physics was held on 10.30 am on 18.04.2018 (Wednesday) at the department of physics under the chairmanship of Dr.T.Arivudainambi, Head, PG and Department of physics. The following members are present in the meeting

Internal Members

1. Prof.S.Dhandapani -
2. Dr. A.Santhanam -
3. Dr.G.Rani -
4. Dr.S.Sakthivel -
5. Dr.S.Rosepriya -
6. Prof.S.Senthilkumari -
7. Prof.B.Shanmugapriya -
8. Dr. S.Nilavazhagan -
9. Dr.S.Veera Rethina Murugan -
10. Dr.T.Ganesh -
11. Prof.N.Chidambaram -
12. Prof.D.Anbuselvan -
13. Dr.P.Jagdish -
14. Dr. P.Paramansivam -

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

External Members

1. Dr.B.Ravikumar -
2. Dr. S.Rajasekar -
3. Dr.P.Philominathan -
4. Dr.P.Thilagan -
5. Dr. V.Senthamizh selvi -

18/4/18
S. Rajasekar 18/4/18
18/4/2018.
18/4/2018

The Syllabi for B.Sc. Physics (Major and Allied), M.Sc. Physics, and M.Phil. Physics under CBCS system was discussed and correction/changes were made and finalized for the academic year 2018-2019 onwards. The finalized syllabus is approved in the meeting which is appended herewith.

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR-613 005.

18/4/18

Dr.T.Arivudainambi

(Chairman BoS - Physics)

RAJAH SERFOJI GOVT COLLEGE (AUTOMONOUS), THANJAVUR-5
C.B.C.S PATTERN FOR ALL P.G. COURSES
SUBJECT:PHYSICS
(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PART	CODE	COURSE	TITLE	HRS / WEEK	MARKS		TOTAL	EXAM HOURS	CREDIT
			I SEMESTER		IA	AE			
III	S1PPH1	CC1	Mathematical Physics - I	6	25	75	100	3	5
III	S1PPH2	CC2	Classical Dynamics	6	25	75	100	3	5
III	S1PPH3	CC3	Electromagnetic Theory	6	25	75	100	3	5
III	S1PPHP1	CC4	Practical - I	6	40	60	100	3	4
III	S1PPHEL1A	EC-1	Communication Electronics	6	25	75	100	3	4
	S1PPHEL1B		Bio Electronics and Bio Sensors						
	S1PPHEL1C		Space Science						
		TOTAL		30			500		23
			II SEMESTER						
III	S2PPH4	CC5	Quantum Mechanics	6	25	75	100	3	5
III	S2PPH5	CC6	Mathematical Physics - II	6	25	75	100	3	5
III	S2PPH6	CC7	Solid State Physics	6	25	75	100	3	4
III	S2PPHP2	CC8	Practical - II	6	40	60	100	3	4
III	S2PPHEL2A	EC2	Microprocessor and Microcontroller	6	25	75	100	3	4
	S2PPHEL2B		Opto electronics						
	S2PPHEL2C		Analytical Instrumentation						
		TOTAL		30			500		22

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

			III SEMESTER						
III	S3PPH7	CC9	Statistical Mechanics	6	25	75	100	3	5
III	S3PPH8	CC10	Spectroscopy	6	25	75	100	3	5
III	S3PPH9	CC11	Nuclear and Particle Physics	6	25	75	100	3	5
III	S3PPHP3	CC12	Practical - III	6	40	60	100	3	4
III	S3PPHEL3A	EC3	Thin Film Physics	6	25	75	100	3	4
	S3PPHEL3B		Computational Physics						
	S3PPHEL3C		Signal Processing						
		TOTAL		30			500		23
			IV SEMESTER						
III	S4PPH10	CC13	Theoretical Physics	6	25	75	100	3	5
III	S4PPHP4	CC14	Practical - IV	6	40	60	100	3	4
III	S4PPHPW	CC15	**Project Work**	6	20	80	100		5
III	S4PPHEL4A	EC4	Applied Physics	6	25	75	100	3	4
	S4PPHEL4B		Nano Physics						
	S4PPHEL4C		High Energy Physics						
III	S4PPHEL5A	EC-5	Material Science	6	25	75	100	3	4
	S4PPHEL5B		Robotics						
	S4PPHEL5C		Non Linear Optics						
		TOTAL		30			500		22
	GRAND TOTAL						2000		90

	No of papers	Credit
Core courses	15	70
Elective cours	5	20
Total	20	90

Separate Passing Minimum is prescried for Internal and External

a) The Passsing minimum for CIA shall be 40% out of 25 Marks(ie 10 Marks)

b)The Passing minimum for Autonomous Examinations shall be 40% out of 75 marks (ie 30 Marks)

c) The Passing minimum not less than 50% in the aggregate

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits	: 5	Code	: S1PPH1
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

MATHEMATICAL PHYSICS – I

Unit 1: VECTOR ANALYSIS – 1

Scalar and vector fields – Gradient, Divergence and Curl – vector identities – second derivatives – Laplacian operator – line, surface and volume integral – Gauss divergence theorem – Greens theorem – Stoke's theorem.

Unit 2: VECTOR ANALYSIS – 2

i. Curvilinear Co-ordinates

Orthogonal curvilinear co-ordinates-- expansion for grad, div curl & Laplacian in cylindrical and spherical co-ordinates.

ii. Vector space

Linear dependence and Linear independence of vectors – bases – Orthogonalities – Gram Schmidt's Orthogonalisation process – Hilbert space.

Unit 3: MATRIX

Solution of liner algebraic equation – Rank of a matrix – Inverse of a matrix - characteristic equation of a matrix – Eigen values and Eigen vectors – Trace of a matrix – Caley Hamilton Theorem – Matrix diagonalization – Types of matrices - Hermitian, Orthogonal, Symmetric, Unitary matrices

Unit 4: SPECIAL FUNCTIONS

Gamma and beta functions – series solution – Legendre, Bessel, Hetmite and Laguerre's differential equations - their solution - Recurrence relation - Rodrigue's formula — Generating functions – Orthogonality relations.- Strum Liouville theorem

Unit 5: NUMERICAL METHODS (using c program)

C-Programming – Solving Algebric equation – Bisection, Newton Raphson and iteration Methods – Numerical integration – Simpson Rule – Trapezoidal Rule – Method of least Square fit - solving differential Equation – Euler method – Runge - Kutta Method - interpolation and extrapolation.

BOOKS FOR STUDY

1.Mathematical physics – Sathyaprakash sultan chand & sons (2014)

2.Mathematical physics – P.K. Chattopadhyay , New age international (1990)

3.Advanced engineering mathematics – E. kreyszig , John Wiley & sons (2006)

4.Matrixces and tensors in physics – A.W.Joshi, New age international (1995)

5.Numerical methods in science and engineering – M.K.Venkatraman, National publishing company (1999)

6.Introductorn to numerical methods -S.Sastry, PHI (1998)

REFERENCE

1.Engineering mathematics – Stroud, ELBS. (1970)

2.Advance Engineering mathematics – Stroud , ELBS (1970)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 – 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 5	Code	: S1PPH2
Hours/Week	: 6	Medium	: English

(For students admitted from 2018- 2019)

CLASSICAL DYNAMICS

Unit I Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and a system of particles – Conservation laws – Constraints – Generalized coordinates – D'Alembert's principle and Lagrange's equation – Hamilton's variational principle – Lagrange's equations of motion from Hamilton's principle – Conservation theorems and symmetry properties – Applications of Lagrange's equations to linear harmonic oscillator, simple pendulum and Atwood's machine.

Unit II Motion Under Central Force

Equivalent one body problem – Inverse square law of force – Kepler's problem – Virial theorem – Scattering in a central force field – Rutherford Scattering – Centre of Mass and Laboratory Co-ordinates.

Unit III Rigid Body Dynamics and Oscillatory Motion

Euler's angles – Moments and products of inertia – Euler's equations - Symmetrical top – Theory of small oscillations – Stable and Unstable equilibrium – Two coupled Oscillators – Double pendulum - Normal coordinates and frequencies – Linear triatomic molecule.

Unit IV Hamilton's Formulation

Hamilton's canonical equations of motion – Hamilton's equations from variational principle – Principle of least action – Canonical transformations – Poission bracket – Hamilton--Jacobi method – Action and angle variables – Kepler's problem in action- angle variables – Applications of Hamilton's equations of motion to linear harmonic oscillator, simple pendulum and charged particles in an electromagnetic field.

Unit V Relativistic Mechanics

Basic ideas of special theory of relativity – Energy momentum four-vector – Minkowski's four-dimensional space – Lorentz transformation as rotation in Minkowski's space – Composition of Lorentz transformation about two orthogonal directions – Thomas precession – Invariance of Maxwell's equation under Lorentz transformation.

Books for Study

1. H. Goldstein, C.P. Poole and J.L. Safko, *Classical Mechanics* (Pearson Education and Dorling Kindersley, New Delhi, 2007).
2. S.L. Gupta, V. Kumar and H.V. Sharma, *Classical Mechanics* (Pragati Prakashan, Meerut, 2001).
3. N.C. Rana and P.S. Joag, *Classical Mechanics* (Tata McGraw-Hill, New Delhi, 1991).

Books for Reference

1. V.B. Bhatia, *Classical Mechanics* (Narosa, New Delhi, 1997).
2. T.L. Chow, *Classical Mechanics* (John-Wiley, New York, 1995).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 5
Hours/Week : 6

Code: S1PPH3
Medium : English

(For students admitted from 2018-2019)

ELECTROMAGNETIC THEORY

Unit 1: ELECTROSTATICS

Coulomb's law, Gauss's law, Poisson and Laplace equations, multipole expansion of a charge distribution-electrostatic boundary conditions, calculation of potential: Laplace equation - method of separation of variables using Cartesian, Spherical, Cylindrical coordinates. Application to parallel, spherical, cylindrical condenser, the classic image, Position & Magnitude, Potential & Intensity, the induced surface charges, and the force between the charge and the plane.

Unit 2: MAGNETOSTATICS

Biot-Savart law: Long straight wire, Circular coil, Solenoid, the divergence and curl of B, Ampere's circuital law, application of Ampere's law - B due to long straight wire, Solenoid, Toroid, Force between two parallel wires, comparison of electrostatics and magnetostatics, magnetic vector potential, magnetostatic boundary conditions, multipole expansion of a current distribution, magnetic susceptibility and permeability.

Unit 3: ELECTROMAGNETISM

Displacement current –equation of continuity, energy in the electromagnetic field, Poynting's theorem, Poynting vector, Maxwell's equations, vector and scalar potentials, Gauge transformations - Lorentz gauge, Coulomb gauge.

Unit 4: PLANE ELECTROMAGNETIC WAVES AND WAVE PROPAGATION

Plane electromagnetic waves in free space, propagation of E.M.W in isotropic dielectrics, propagation of E.M.W. in anisotropic dielectrics-propagation of E.M.W. in conducting media-Propagation of E.M.W. in ionized gases, Reflection and refraction of E.M.W, Fresnel formulae, Brewster's Law and polarization of E.M.W, total internal reflection and critical angle.

Unit 5: RADIATING SYSTEMS

Oscillating electric dipole, Radiation from an oscillating dipole, Electric quadrupole Radiation, Radiation from a small current element, Radiation from a linear antenna, Radiation from a linear half wave antenna, antenna arrays.

BOOKS FOR STUDY:

1. K.L. Chopra, G.C. Agrawal K. Nath & Co Meerut. Electromagnetic theory. (Electrodynamics 2005)
2. J.D. Jackson, Classical Electrodynamics, Wiley Eastern, 1988.
3. Satyaprakash Kedarnath & Ramnath & Co Meerut. Electromagnetic Theory and Electrodynamics-2005.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)
Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)
Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4
Code :S1PPHP1
Hours/Week : 6
Medium : English

(For students admitted from 2018-2019)

PHYSICS PRACTICALS - I
(GENERAL & ELECTRONICS)

(Any Fifteen)

1. Determination of q, η, σ by elliptical fringes method.
2. Determination of Stefan's constant.
3. Planck's constant Determination.
4. Determination of λ- using LASER light
5. Four probe method – Determination of resistivities of powdered samples.
6. Determination of magnetic susceptibility of liquid by Guoy's method.
7. Determination of magnetic susceptibility of liquids by Quincke's method.
8. Charge of an electron by spectrometer.
9. Determination of wave length of monochromatic source using biprism
10. Determination of specific rotatory power of a liquid using polarimeter.
11. Forbe's method of determining thermal conductivity.
12. Determination of width of the given single slit and diameter of the given circular aperture – using LASER source
13. Production and measurement of vacuum
14. Substrate Cleaning
15. Thin film evaporation
16. Thin film thickness measurement
17. Efficiency measurement of standalone solar pv system
18. Identifying and measuring the parameters of a solar PV module in the field
19. Series and Parallel connection of PV modules
20. Estimating the effect of sun tracking generation by solar PV modules
21. Determination of dielectric constant of a liquid by RF oscillator method.
22. Transistor power amplifier.
23. FET Amplifier.
24. Relaxation oscillator using UJT.
25. Design and study of MonostableMultivibrator

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 4	Code	: S1PPHEL1A
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

COMMUNICATION ELECTRONICS

Unit 1: ANTENNAS

Antennas – Equivalent circuits – Thin linear antenna – Loop antennas – Radiation fields – Polarization – Isotropic radiator – Power gain – Effective parameters of an antennas – Dipole arrayed antennas – VHF, UHF and Microwave antennas

Unit 2: MICROWAVE GENERATION AND APPLICATION

Klystron – Magnetron – Traveling Wave Tube – Microwave Propagation through waveguides – HOI and EOI modes – Attenuators – Crystal Detection – Measurement of SWR – Radar equation – Detection and ranging – Transmitters and Receivers.

Unit 3: COMMUNICATION SYSTEMS

Amplitude modulation – AM transmitters-Single side Band Principles – Balanced Modulator – SSB Generation and Reception – Frequency Modulation – FM transmitters – FM detectors – Pulse Modulation – Pulse Time Modulation –Pulse Width Modulation – Pulse Code Modulation – Delta Modulation.

Unit 4: OPTIC FIBER COMMUNICATION

Introduction – Electromagnetic wave Propagation in step index fiber and graded index fibers – Single mode fiber – Types of single mode fibers – Fiber parameters – Sources and detectors (semiconductor types) – Optic fiber communication system.

Unit 5: MULTIPLE ACCESS METHODS AND NETWORKS

Frequency Division Multiple Accessing (FDMA) – Time Division Multiple Accessing (TDMA) – Carrier Sense Multiple Accessing (CSMA) – ALOHA – Code Division Multiple Accessing (CDMA).

Types of Networks (Circuit Switching, Message Switching, Packet - switched Networks) – Design features of Computer Communication Networks – ISDN – LAN – WAN – OSI Protocol of Network Architecture – Introduction to Mobile Telephone Communication (The Cellular concept).

BOOKS FOR STUDY / REFERENCE:

1. Dennis Ruddy and John Coolen, Electronic Communications. PHI, New Delhi(1991)
2. G.Kennady, Electronic Communication systems, Tata Mc Graw Ltd. (1999).
3. Gowar, Optical Communication, Prentice Hall of India Ltd. (1993).
4. H.Taub and D.L.Schilling, Principles of Communication Systems, Tata Mc GrawHill Edition(1986).
5. Louis E.Frenzel, Coomunication Electronics Principles and Applications, Tata McGrawHill Edition.(2006).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4 | Code : S1PPHEL1B
Hours/Week : 6 | Medium : English

ELECTIVE COURSE

BIOELECTRONICS AND BIOSENSORS

UNIT I : Introduction

Nature of Biomedical signals; Bio Electronic potentials; Necessity of Bio Electronics; Components; Scope and Application; Basics of cell biology; Structure of the cell, the nervous system and the neuron; function of enzymes; nucleus and role of DNA and RNA, adhesion of cell to surfaces.

UNIT II : Bio electronic device production

Elements in contact with the surface of a biomaterial: blood composition, plasma proteins, cells, tissues – Phenomena at the bio interfaces. Molecular and cellular processes with living environment, blood-materials interaction, short and long term reactions to the body – Testing of biomaterials: in vitro, in vivo preclinical and in vivo clinical tests – Technologies of biomaterials processing, as implants and medical devices; improvement of materials biocompatibility by plasma processing.

UNIT III : Materials in clinical devices

Metals: Sulzer recall of prosthetic hip implant – Composition of stainless steel and Fe/Co/Ti alloys; Mechanical – properties – Hard Materials: Bio ceramics and Bio glasses, Carbons, Polymers as Biomaterials – Biodegradable Polymers – Composites. Biological reactions to implants – Natural Biomaterials – Collagen – Potential advantages and Developments towards a bio molecular computer, development of molecular arrays as memory stores – molecular wires and switches; mechanisms of unit assembly.

UNIT IV : Biosensors

Introduction to Biosensors – Types of sensors – target analytes – various recognition – signals and device types – basic design consideration – calibration – dynamic range – signal to noise – sensitivity – selectivity – interference – immobilization – adsorption – encapsulation– covalent attachment – device integration: micro scale and nano scale–Bio MEMS–nano wires–Quantum dots–magnetic beads, PEBBLE sensors.

UNIT V : Electrical signal transduction

Seismic (mass) and thermal sensors: Electromechanical resonance – electrochemical forces – Henry's and ideal gas laws – Surface acoustic wave (SAW) devices – atomic force microscopy – manometric sensors – thermometric detection – Electrochemical sensors: Redox potentials, membrane potential, Gauss's Law, basic electrochemistry; conductimetric sensors; potentiometric sensors (ISE's and ISFETs); amperometric sensors; Charge sensing with FET. link equation, Link budget – INSAT Communications Satellites.

BOOKS FOR STUDY AND REFERENCE:

1. H. Boenig, Fundamentals of Plasma Chemistry and Technology, Technomic Publishing Co.Inc. Lancaster Basel (1990).
2. Itamar Willner and Eugenii Katz, Bioelectronics: From Theory to Applications, John Wiley (2005).
3. S. Bone and B. Zebba, Bioelectronics, Wiley (2012).
4. J. Koryta, Ions, Electrodes and Membranes, Second Edition, John Wiley (1991).
5. B. D. Ratner and A. S. Hoffman, Biomaterials Science: An Introduction to Materials in Medicine, Academic Press, New York (1996).
6. B.R. Eggins, Chemical Sensors and Biosensors, John Wiley and Sons (2002).
7. E.A. Hell, Biosensors, John Wiley and Sons, New York (1997).
8. J. B. Park and J.D. Bronzion, Biomaterials: Principles and Applications, CRC Press (2003).
9. J. W. Gardner, V.K. Varadan, and O. O. Awadelkarim, Micro Sensors, MEMS and Smart Devices, Wiley (2001).
10. Sujatha V. Bhat, Biomaterials, Narosa Publishing House, New Delhi (2002).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)
Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)
Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits	: 4	Code	:S1PPHEL1C
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

SPACE SCIENCE

Unit 1: Universe

Large Scale Structure of the Universe: Astronomy and Cosmology, Our Galaxy,Galaxy types, Radio sources, Quasars, Structures on the largest scale, Coordinates and catalogues of astronomical objects, Expansion of the Universe

Unit 2:The evolution of Stars

Introduction, Classification of Stars: The Harvard classification, Hertzsprung -Russeldiagram, Stellar evolution, White dwarfs, Electrons in a white dwarf star,Chandrasekhar limit, Neutron stars, Black holes, Supernova explosion, Photon diffusion time, Gravitational potential energy of a star, Internal temperature of a star,Internal pressure of a star.

Unit 3:The active Sun

Introduction, Sunspots and Solar storms, Sunspots and Solar activity, Cosmic rays of Solar origin, The Solar wind, Solar corona and the origin of the solar wind, Disturbed Solar wind.

Unit 4: The earth's Atmosphere

Introduction, Nomenclature and temperature profile, Temperature distribution in the troposphere, Temperature of stratosphere, temperature of mesosphere and thermosphere,Temperature variability, The pressure profile, Scale height, Density variation. The Ionosphere: Effect on scale height, Ionospheric electric fields, Ionization profile, Layer of charge, Ionospheric hydrogen and Helium.

Unit 5:Magnetosphere

Introduction, The magnetic field of Earth, Earth's variable magnetic field, Solar activity and Earth's magnetic weather, solar wind interaction, The Chapman-Ferraro closed magnetosphere, Dungey's open magnetosphere, Structure of the magnetosphere: Magneto tail and Plasma sheet, Plasma sphere, Earth's radiation belts.

Books for Study

1. Introduction to Space Science – Robert C Hymes (1971), John Wiley & Sons
2. Earth's Proximal Space- Chanchal Uberoi (2000), Universities Press (India)
3. Introduction to Cosmology- J. V. Narlikar (1993), Cambridge University Press
4. Modern Physics- R. Murugeshan, Kiruthika Sivaprasath (2007), S.Chand &Company Ltd.

Books for reference

1. Space Physics and Space Astronomy – Michael D Pappagiannis (1972),Gordon and Breach Science Publishers Ltd.
2. Introductory Course on Space Science and Earth's environment-Degaonkar (Gujarat University, 1978).
3. Introduction to Ionosphere and magnetosphere- Ratcliffe (CUP, 1972)
4. The Physics of Atmospheres-Houghton (Cambridge University Press)
5. Introduction to Ionospheric Physics-Henry Rishbeth &Owen K. Garriot (Academic Press, 1969)
6. Space Science –Louise K. Harra& Keith O. Mason(Imperial College Press,London, 2004)
7. Introduction to Space Physics- Kivelson and Russel
8. Introduction to Astrophysics – Baidyanadh Basu
9. Astrophysics - K. D. Abhayankar (University Press)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 5 | Code :S2PPH4
Hours/Week : 6 | Medium :English

(For students admitted from 2018-2019)

QUANTUM MECHANICS

Unit 1: FORMULATION OF QUANTUM MECHANICS

Derivation of Schrodinger's wave equation - Physical interpretation and condition on the wave function – Box normalization -Expectation value – Ehrenfest Theorem – Postulates in Quantum mechanics – Heisenberg's uncertainty Principle.

Unit 2: OPERATOR FORMALISM

Operator formalism – Linear operators – Self ad joint operators – Parity operator – Commutators – Simultaneous Eigen Functions – Physical meaning of Eigen functions and Eigen values.

Exactly solvable systems:

Particle in a box – Square well Potentials – Linear harmonic oscillator – Rigid Rotator – Hydrogen atom.

Unit 3: APPROXIMATION METHODS.

Time independent perturbation theory:

Non - Degeneration case. First and Second order perturbation – Degenerate case – Stark effect – Variation method – Applications.

Time dependent perturbation theory:

Constant perturbation – Harmonic perturbation – Stimulated emission and absorption – Einstein's coefficients.

Unit 4: ANGULAR MOMENTUM

Angular momentum operators in Spherical polar coordinates – Eigen value spectrum – commutation relations of J , Jx , Jy, Jz ,Jx + - Eigen value spectrum of J and Jz by commutation relation – Matrix representation of J , Jx , Jy ,Jz.

Matrix mechanics – Schrodinger's picture – The Heisenberg picture – the interaction picture – Dirac's Bra and Ket Vectors – Hilbert space.

Unit 5: RELATIVISTIC WAVE MECHANICS

The Klein – Gordan equations – Charge and current densities – Dirac's equation – Dirac's Relativistic Hamiltonian – Dirac's Matrices – Free particle solutions – Significance of negative energy states – spin angular momentum.

BOOKS FOR STUDY:

1. Quantum Mechanics - Satya Prakash, Pragati Prakashan Meerut, (2013).
2. Quantum Mechanics by Ajoy Ghatak, S. Lokanathan, Springer Science, Kulwer Academic Publisher, (2004)
3. Quantum Mechanics Leonard I. Schiff , Tata McGraw Hill New Delhi. (1968.)

REFERENCES:

1. A Text Book Of Quantum Mechanics – P. M .Mathews and Venkatesan – Tata McGraw Hill (1976).
2. Advanced Quantum Theory and Fields - S.L. Gupta I. D. Gupta S. Chand and company New Delhi,(1982)
3. Angular momentum Techniques in Quantum Mechanics – V. Devanathan, Springer,(1999).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 5	**Code**	: S2PPH5
Hours/Week	: 6	**Medium**	: English

(For students admitted from 2018-2019)

MATHEMATICAL PHYSICS – II

Unit 1: COMPLEX VARIABLES

Functions of complex variables – Differentiability – Cauchy - Riemann conditions –Harmonic function - integrals of complex function – Cauchy's integral theorem and integral formula – Analytic function and Singularity- Types of singularity- Taylor's and Laurent's series. – cauchy residue theorem

Unit 2: FOURIER AND LAPLACE TRANSFORM

Fourier series – Dirichlet's conditions – Sine and Cosine series – Fourier integrals – Fourier transforms – Faltung theorem – Application to heat and wave equations.

Laplace transform –theorems - Inverse Laplace transform – Solving differential equation

Unit 3: GREEN'S FUNCTION AND PROBABILITY

i. Green function

Green's functions – properties – methods of solutions in one dimension – Linear integral equations.

ii. Probability

Introduction – Random variables – Binomial, Normal and Poisson distribution Central limit theorem.

Unit 4: TENSORS and Dirac delta Function

i. Tensors

Transformation of co-ordinates – Summation convention – Contravariant – Covariant and mixed tensors – Rank of a tensor – Symmetric and Anti symmetric tensors – contraction of tensors – Raising and Lowering of indices – Metric tensors.

ii. Dirac Delta Function

Definition of Dirac Delta function - different representation of Dirac Delta Function.

Unit 5: GROUP THEORY

Basic definitions – Multiplication table – Sub groups, Co sets and classes – Direct product groups - Definition of group – Rearrangement theorems – Lagrange's theorem - rotation group – symmetric operation of C_{4v} and C_{3v} groups – Representation theory – Homomorphism and Isomorphism – reducible and irreducible representations – Schur's lemmas – The great Orthogonality theorem – Character Tables

BOOKS FOR STUDY

1. Mathematical physics – Sathyaprakash , Sultan Chand & Sons (2014)
2. Mathematical physics – P. K. Chattopadhyay,, New Age International (1990)
3. Advanced engineering mathematics – E. Kreyszig , John Whiley & Sons (2006)
4. Group theory for Physicst – A. W. Joshi,Wiley Eastern ltd (1982)
5. Complex variable – Speigel (Schaam series)

REFERENCE

1 Engineering mathematics – Stroud., ELBS (1970)

2 Advanced Engineering Mathematics - Stroud , ELBS (1970)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	**: 5**	**Code**	**: S2PPH6**
Hours/Week	**: 6**	**Medium**	**: English**

(For students admitted from 2018-2019)

SOLID STATE PHYSICS

Unit 1 : Crystal Structure

Basics of crystal systems – Bravais Lattices - X-ray Diffraction – Bragg's Law - Reciprocal lattice of BCC, FCC Lattices – Bragg's condition in terms of Reciprocal Lattice – Brillouin Zones - Ewald's sphere construction – Atomic Scattering factor – Structure factor – Experimental techniques – Laue, Powder, Rotating Crystal Method of X-Ray Diffractions.

Unit 2: Lattice Vibrations and Thermal Properties

Vibration of monoatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons – Lattice heat capacity – Einstein model – Density of modes in one-dimension and three dimension – Debye model of the lattice heat capacity.

Unit 3: Conductors and Superconductors:

Heat Capacity of Electron Gas in 3 Dimension - Electrical resistivity of metals - Nearly free electron model - Tight binding approximation – Experimental methods in Fermi Surface studies – De Haas-van Alphen Effect - Superconductivity – Transition temperature - Meissner effect - BCS theory - Coherence length - Origin of energy gap and its temperature dependence - London Equation - Josephson Effect – Flux quantization - SQUID - Type I and Type II Super Conductors – High Temperature Superconductors.

Unit 4: Semiconductors and Dielectrics:

Carrier concentration in intrinsic and extrinsic semiconductors - electrical conductivity in intrinsic semiconductors - Hall effect in Semiconductors - Local Field at an atom - Clausius-Mossotti relation - Polarizabilities: Electronic, Ionic, Orientational and Space charge - Frequency dependence of polarizabilities - Piezo - Pyro and Ferro electric properties.

Unit 5: Diamagnetism, Para magnetism and Ferro magnetism

Magnetic dipole moment - Permeability and susceptibility - Origin of permanent magnetic moments - Classical and Quantum theories of diamagnetism - Langevin's theory of paramagnetism - Weiss molecular field theory - Adiabatic demagnetisation – Classical theory of ferromagnetism – Magnons - Ferromagnetic domains - Domain theory of ferromagnetism – Antiferromagnetism – Ferrimagnetism – Structure of Ferrites.

BOOKS FOR STUDY / REFERENCE:

1. Kittel. Introduction to Solid State Physics. 5th Edition. John Wiley and sons New Delhi. (2003).
2. J. Dekker, Solid State Physics. Macmillan. Madras. (1971).
3. S.L. Gupta and V. Kumar, Solid State Physics, K. Nath & CO., Meerut.
4. N.W Asheroft and N.D. Mermin, Solid State Physics, Holt Reinhart and Winston, International Edition, Philadelphia (1978)
5. J.P.Srivastava, Elements of Solid state physics, Second edition Prenlice Hall of India, New Delhi 2008.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

HOD Signature

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)

Credits : 4
Code :S2PPHP2
Hours/Week : 6
Medium : English

(For students admitted from 2018-2019)

PHYSICS PRACTICAL – II
ADVANCED GENERAL EXPERIMENTS

(Any Fifteen)

1. Determination of q, η, σ by hyperbolic fringes method.
2. Determination of e / m of an electron by magnetron method
3. Stefan's Law – verification
4. Optical Fibre – measurements of attenuation coefficient and Numerical aperture
5. Determination of carrier concentration and Hall coefficients in semiconductors.
6. Determination of magnetic susceptibility of powdered sample byGuoy's method.
7. Polarizabillity of liquids by finding the refractive indices at different wavelengths.
8. Determination of refractive index of liquids using biprism(by scale & telescope method).
9. Determination of bulk modulus of a liquid by ultrasonic wave propagation.
10. Rydberg's constant using spectrometer.
11. Thin films capacitors
12. Calculation of absorption coefficient and band gap energy of Thin films
13. Thickness distribution
14. Thin film resistors
15. Measurement of current-voltage characteristics of crystalline silicon solar cell
16. Measurement of current-voltage characteristics of two solar cells connected a) in series & b) in parallel
17. Dependance of current-voltage characteristics of crystalline silicon solar cell on a) light intensity & b) temperature of solar cell
18. Carrier lifetime in a solar cell
19. Spectral response measurement
20. Characteristics of UJT.
21. Characteristics of LDR.
22. Study of a feedback amplifier – Determination of band width, input and output impedances
23. Characteristics of SCR.
24. Determination of wavelength of LASER light using Transmission grating
25. Determination of dielectric constant of a liquid by RF oscillator method.

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 5	Code	:S2PPHEL2A
Hours/Week	: 6	Medium	: English

(For PG students admitted from 2018-2019)

MICROPROCESSOR AND MICROCONTROLLER

Unit I: INTEL 8085

INTEL 8085 microprocessor architecture – Pin configuration – Various registers – Instruction cycle – Fetch – Execute operation – Machine cycle and state – Instructions and data flow – timing diagram – timing diagram for opcode fetch cycle – Memory read cycle – I/O read cycle – memory write cycle – I/O write cycle.

Unit II: ASSEMBLY LANGUAGE PROGRAMS

Instruction set – Data transfer group – Arithmetic group – Logical group – Branch group – Machine control group – Addressing modes – Stack – Subroutine – Macro – Delay subroutine.

Assembly language programms – addition and subtraction of two 8-bit numbers – Multiplication and Division of two 8-bit numbers – BCD arithmetic – To find the biggest and smallest number in a data array – arranging a list of numbers in ascending or descending order-16-bit addition-complement, shift.

Unit III: PERIPHERAL DEVICES AND THEIR INTERFACING

Interfacing memory and I/O devices – I/O mapped I/O and memory mapped I/O – Memory and I/O interfacing – Data transfer schemes – Programmable Peripheral Interface -Architecture of INTEL 8255A -Control word- -Programmable DMA controller (8257) —Programmable Interrupt Controller (8259) – Programmable communication Interface (Intel 8251)-Programmable counter (Intel 8253).

Unit IV: MICROCONTROLLER – 8051

Features of 8051 –Architecture- pin configuration – Registers – Program counter – Stack ,PSW, SFR – Addressing modes – Jump Call Instructions – Time delay generations and Calculations - Arithmetic and Logic instructions –Bit instructions-assembly Language Programming -Timing subroutines-Time delay using software alphabetical order-delay subroutines-calculation of time delay.

Unit V: MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS

Microprocessor interfacing and applications:

Interfacing 7 segment LED display - temperature measurement – Measurement of frequency, voltage and current – traffic light control interfacing - Interfacing of ADC - Interfacing of DAC .

Microcontroller interfacing and applications:

Interfacing of Stepper motor- keyboard Interface.

BOOKS FOR STUDY :

1. B. Ram, Fundamentals of Microprocessors and Microcomputers, 5th edn, Dhanapat Rai Publications (P) Ltd., New Delhi (2001).
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi – the 8051 Microntroller and Embedded systems, pearson education, Delhi, Seventh Indian reprint 2004.

BOOKS FOR REFERENCE:

1. Ramesh S. Goankar, Microprocessor Architecture Programming and Applications with the 8085, 5th edn., Pergaman International Publishing (India) Pvt.Ltd.
2. A.P. Godse, Microprocessors and its Applications(First Edition Pune 2006).
3. A.Nagoor kani,Microprocessor and Microcontroller's ,RBA Publications,Chennai-2006.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 4 | Code :S2PPHEL2B

Hours/Week : 6 | Medium : English

ELECTIVE COURSE

OPTO ELECTRONICS

UNIT I : Introduction

Propagation of electromagnetic waves in dielectric wave guides – fibers – boundary conditions – phase velocity and group velocity – Dispassion – cut off frequencies - EM field in core and cladding – single mode and multimode fibers.

UNIT II : Active Devices

LED's lasers – Laser principles – spontaneous and stimulated emission – coherence – gain equation – three level, four level lasers- examples of lasers (He-Ne) Ruby, diode – homojunctioin and heterojunction diode lasers.

UNIT III : Fibre Optics Communication

LED and lasers source – Transmitter modulator – acousto – optic, electro optic modulator – AM, FM, DCM modulation – detection and demodulation radiation detection – PIN, APD and PM tube.

UNIT IV : Optical Fiber Sensors

General features, types of OFS, intrinsic and extrinsic sensors, intensity sensors, shuttes based multimode OFS, simple fiber based sensors for displacement, temperature and pressure measurements – reflective OFS and applications, Fiber Bragg grating based sensors.

UNIT V : Interferometric FOS

Basic principles, interferometric configurations, Mach – Zendes. Michelson and Fabry – Perrot configurations – components and construction of interferometric FOS, applications of interferometric FOS, Sagnac interferometer, fibers gyro, OTDR and applications.

BOOKS FOR STUDY AND REFERENCE

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

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4 Code :S2PPHEL2C

Hours/Week : 6 Medium : English

ANALYTICAL INSTRUMENTATAION

UNIT-1 Introduction

Introduction to Chemical Instrumental Analysis - advantages over classical methods - Basic functions of instrumentation – signal to noise ratio – sensitivity and detection limit - spectrometric methods – Molecular, Electronic and vibrational energy levels – Atomic energy levels.

UNIT-2 An Introduction to Spectrometric Methods

Quantum mechanical properties of radiation - Atomic absorption spectroscopy - Principle - working - Instrumentation - back-ground correction - Atomic Emission Spectroscopy - Principle - Types -Flame photometer - DC arc and AC arc excitation - plasma excitation - Fluorescence and Phosphorescence spectroscopy – Instrumentation for phosphorescence measurements.

UNIT-3 Molecular Spectroscopy

Introduction to Molecular spectroscopy – Beers law - Quantitative methodology – UV-Vis spectrometry – Instrumentation – single and double beam spectrometers – quantitative application of UV-Vis absorption spectroscopy – Theory of IR spectroscopy - Principle - sources, detectors, dispersive and Fourier Transform IR spectroscopy – application of IR spectroscopy (Near and Far IR).

UNIT-4 Raman Spectroscopy and X-ray Spectroscopy

Theory of Raman spectroscopy – Instrumentation – sample handling and Illumination – structural analysis – applications of Raman spectroscopy – Production of X-rays – X ray absorption and diffraction – Auger Emission spectroscopy (AES) – Electron spectroscopy for chemical analysis (ESCA).

UNIT -5 Microwave and Nuclear Magnetic Spectroscopy

Microwave spectroscopy – basic principle - Instrumentation – Structural analysis for organic compounds – Fundamentals of NMR - continuous and Fourier Transform NMR spectrometer – Instrumentation – spectra and molecular structure - elucidation of NMR spectra – Applications of H^1 and C^{13} NMR – quantitative analysis - NMR imaging in medicine.

BOOKS FOR REFERENCE:

1 .Instrumental Methods of Analysis, Willard, Merritt, Dean, Settle, CBS Publishers & Distributors, New Delhi, 7th edition.

2. Principles of Instrumental Analysis, Skoog, Holler, Nieman, Thomson brooks-Cole publications, 6th Edition.

3. Silverstein M.R., Bassler C.G. and Morrill C.T., "Spectrometric Identification of Organic compounds", John Wiley & Sons, 1991.

4. Introduction to Instrumental Analysis, Robert D. Braun, McGraw-Hill Book Company.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 5 Code :S3PPH7
Hours/Week: 6 Medium : English

(For students admitted from 2018-2019)

STATISTICAL MECHANICS

Unit 1: STATISTICAL THERMODYNAMICS

Energy and first law of thermodynamics - Heat content and Heat Capacity-Specific heat – Entropy and second law of thermodynamics – thermodynamic potential and the reciprocity relations – Gibb's paradox -Maxwell's relations – Deductions – Properties of thermodynamic relations – Gibb's-Helmholtz relation - Nernst Heat theorem of third law – consequences of third law – Gibb's phase rule – chemical potential.

Unit 2: KINETIC THEORY

Boltzmann transport equation and its validity - Boltzmann's H-theorem and its analysis – Method of most probable distribution - Transport phenomena- Mean free path - Conservation laws - Zero and first order approximations – Viscous hydrodynamics – Navier – Stoke's equation.

Unit 3: CLASSICAL STATISTICAL MECHANICS

Macro and micro states – statistical equilibrium – Phase space - Ensembles –Micro canonical ensemble and Grand canonical ensembles – Liouville's theorem – Maxwell – Boltzmann distribution law - Principles of equi partition of energy – Partition function – Relation between partition function and thermodynamic quantities

Unit 4: QUANTUM STATISTICAL MECHANICS

Black body radiation -Planck's formula – Photon gas – Specific heat of solids – Einstein's Quantum theory – Dulong and Petit's law -Debye's quantum mechanical theory

Bose – Einstein statistics - Bose – Einstein condensation – Liquid helium

Fermi Dirac statistics – Fermi – Dirac gas –Properties – Degeneracy – Electron gas – Free electron model and thermionic emission.

Unit 5: ADVANCED TOPICS IN STATISTICAL MECHANICS

Landau's theory of phase trasition – First and second order -Ising and Heisenberg models – Elements of non-equilibrium – phenomena – Fluctuations – Wiener–Khintchine theorem – Thermodynamics of irreversible processes – Onsager's reciprocity relations.

BOOKS FOR STUDY / REFERENCE:

1. Thermodynamics And Statistical Physics – Satya prakash and J.P.Agarwal (2008).
2. Statistical Mechanics - Gupta and Kumar – A Pragati Edition – (1999).
3. Thermal Physics - by S Garg, R. Bansal , C. Ghosh - Tata McGraw-Hill Education, (2013).
4. 3. R. Huang, Statistical Mechanics, Wiley Eastern Ltd., New Delhi, (1983)

References:

1. F. Reif, Statistical and Thermal physics, McGraw Hill, International Edition, Singapore (1979)
2. Bk Agarwal, Melvin Eisner, Statistical Mechanics, New Age International (P) Ltd, (2016).
3. F. Mandl, Statistical physics, John Wiley, London, (1971)
4. C. Kittel, Thermal physics, 2nd Edn.(1980).Publisher Alexis Hart.
5. Thermodynamics & Statistical Physics Sl Kakani Published by Sultan Chand & Sons (1987)
6. Molecular Physics - by A. N. Matveev – MIR publisher – (1985).
7. Bose and His Statistics – G.Venkataraman – University press – (1992)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 5	Code	: S3PPH8
Hours/week	: 6	Medium	: English

(For students admitted from 2018-2019)

SPECTROSCOPY

UNIT I: IR AND MICROWAVE SPECTROSCOPY

Quantization of energy – Regions of the spectrum – Classification of molecules – Vibrating diatomic molecule as a harmonic and unharmonic oscillator – polyatomic molecules – Classification of modes of vibrations – Bond stretching, Angle deformation, rocking, Wagging, Out of plane deformation, Twisting and Torsion - Parallel and perpendicular bands of symmetric top molecules – IR Spectrometer.

Interaction of radiation with rotating molecule – Rigid rotator – Frequency of rotational spectral lines, selection rules of rotational spectra – Non rigid rotator – linear polyatomic molecules – Microwave Spectrometer.

UNIT II: RAMAN AND LASER SPECTROSCOPY

Raman Effect – Theory of Raman scattering – Quantum theory of Raman effect –Pure Rotational - Vibrational Rotational Raman spectra – Difference between Raman and IR Spectra - Mutual exclusion principle - FT Raman Spectrometer –Raman Microscopy

Nonlinear optical effect – Hyper Raman effect – Classical treatment of Hyper Raman effect – Coherent Anti stokes Raman scattering (CARS) – Advantages and disadvantages of CARS compared to normal Raman scattering.

UNIT III: ELECTRONIC AND PHOTOELECTRONIC SPECTROSCOPY

Born Oppenheimer Approximation – Vibrational coarse structure – Intensity of vibrational electronic spectra - Franck- Condon principle – Dissociation energy and dissociation products – Rotational fine structure of Electronic- Vibration spectra – Fortrat parabolae.

Molecular Photo electron Spectroscopy – Photo Electric effect - Principle – Ultraviolet Photo Electron Spectroscopy (UPES) – Information from Photoelectron Spectra – photoelectron Spectrometer.

UNIT IV: MAGNETIC RESONANCE SPECTROSCOPY

NMR: Nucleus in a magnetic field – Resonance condition – Spin-Spin and Spin- Lattice Relaxation times – Bloch equations – Chemical shift - NMR Spectrum – Single and double coil Spectrometer.

ESR: Principle – Position of ESR absorptions - g factor — ESR spectra of free radicals in solutions –CH_3 Radical and Benzene Anion - Hyperfine structure of Hydrogen, Deuterium and Tritium - ESR Spectrometer.

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Code : S3PPH8

UNIT V: APPLICATIONS OF SPECTROSCOPY

IR: Identification of molecular constitutions – Elucidation of molecular structure – Characterization of transition phases of ceramics - Biological applications.

Raman: Single crystal Raman spectra –Structure determination - Molecules of types XY_2, XY_3 and XY_4 using IR and Raman. Raman spectral study of proton conduction in solids.

Microwave: General applications - Microwave Oven.

NMR: Applications in medical field - Nuclear Magnetic Resonance Imaging – Industrial applications.

ESR: Identification, Structure elucidation and study of transient paramagnetic species– Biological, chemical and analytical applications.

BOOKS FOR STUDY

1. Colin. N. Banwell and Elaine M.Mccash, Fundamentals of Molecular Spectroscopy, Tata McGraw-Hill Publishing Company Limited, 4th Edition (1994).
2. Aruldas. G, Molecular Structure and Spectroscopy, PHI Learning Private limited, 2nd Edition (2009).
3. Gupta.S.L. Kumar.V. Sharma. R.C, Elements of Spectroscopy – Atomic, Molecular and Laser Physics, Pragati Prakashan, 26th Edition (2014).
4. Sathyanarayana. D. N, Vibrational Spectroscopy- Theory and Applications, New Age International Private Limited, Publishers (2011).

BOOKS FOR REFERENCE

1. Straughan.B.P and Walker.S, Spectroscopy, Volume Two, John Wiley and Sons, Inc. (1976).
2. Suresh Chandra, Molecular Spectroscopy Narosa Publishing House (2009).
3. Sathyanarayana.D.N. Introduction to Magnetic Resonance Spectroscopy, ESR, NMR, NQR, I.K. International Publishing House Pvt. Ltd.(2009).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	**: 5**	**Code**	**:S3PPH9**
Hours/Week	**: 6**	**Medium**	**: English**

(For students admitted from 2018-2019)

NUCLEAR AND PARTICLE PHYSICS

Unit 1: NUCLEAR STRUCTURE

General properties of nucleus – – binding energy - nuclear stability – semi empirical mass formula – nuclear angular momentum

Deutron basic properties – ground state of Deutron – proton neutron scattering at low energy – scattering length – phase shift

Nuclear forces - meson theory of nuclear forces – Yukawa potential. – properties of nuclear force – spin dependence, charge independence – Exchchage property

Unit 2: RADIACTIVE DECAY

Alpha decay - Geiger – Nuttal law – Gamow's theory of alpha decay – Pauli's neutrino hypothesis – Fermi's theory of beta decay – Selection rules – Multi pole in gamma transition – Internal conversion – Nuclear isomerism.

Radioactive Growth and Decay – Ideal Equilibrium – Transient Equilibrium – secular Equilibrium – determination of age of the earth – carbon dating.

Unit 3: NUCLEAR REACTION and MODELS

Kinds of nuclear reaction —— Direct reaction – Theory of stripping and Pick up reactions – stages of reaction – compound nucleus - nuclear scattering and reaction cross section. – Level width – Resonance theory - Breit wigner formula

Liquid drop model – magic numbers – shell model – different potential – magnetic moment – spin orbit coupling – evidences for shell model – collective model

Unit 4: NUCLEAR FISSION

Types of fission – Mass and kinetic energy distribution of fission fragments – Neutron emission in fission – types of nutrons – neutron reactions – fission cross section

Bohr wheeler theory of nuclear fission — Nuclear chain reactions – Critical size – Four factor formula - moderators - General aspects of nuclear design – Classification of reactors – Breeder reactor - fissile and fertile materials

Nuclear fusion – Solar fusion – Controlled thermo nuclear fusion reactions - Thermo nuclear bomb

Unit 5: ELEMENTARY PARTICLES

Fundamental interactions – Antiparticles - Classification of elementary particles –Strange particles - Conservation laws and Quantum numbers – Baryon number, lepton numbers, isospin, strangeness, parity, charge conjugation, time reversal – CPT theorem – Parity violation – CP violation – Symmetry and conservation laws – Quark model – SU(2) amd SU(3) symmetry. - Gellman Okuba formula.

BOOKS FOR STUDY

1. Elements of Nuclear Physics – M. L. Pandya & R. P. S. Yadav Kedarnath &Ramnath (1988)
2. Nuclear physics – D. C. T. Tayal, Himalaya publications (1998)

REFERENCE

1. Amazingly Symmetrical World – L. Tarasov, MIR (1973)
2. Nuclear and Particle Physics – Ashok Das & T. Ferbel , John Wiley (1993)
3. Introduction to Elementary Particles – Longo, Mc GrawHill) (1973)
4. Nuclear Physics – Y. M. Shirakov& N. P. Yudin , MIR (1982)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

HOD Signature

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 5
Code : S3PPHP3
Hours/Week : 6
Medium : English
Semester : 3

(For students admitted from **2018-2019**)

PHYSICS PRACTICAL - III

(Choose Any **Fifteen** experiments)

1. Operational Amplifier-Parameters –Open loop gain, Closed loop gain, Input impedance, Output impedance,CMRR.
2. Operational Amplifier- Adder, Subtractor, Sign changer, Differentiator and Integrator.
3. Operational Amplifier- Low pass, High pass and Band pass filters.
4. Operational Amplifier-Clipping and Clamping Circuits.
5. Half adder and Full adder using NAND gates.
6. Multiplexer (4 to1, 8 to1,16 to1).
7. Simplification of Boolean expressions (any 4 expression) using Boolean theorems.
8. One- bit and Four- bit digital Comparator.
9. D/A Conversion- R-2R Binary ladder- Weighted Resistor Network.
10. Synchronous Counter- Up Counter and Down Counter.
11. Shift Register-SISO,SIPO (Shift left and Shift right).
12. BCD to Seven Segment Decoder.
13. Digital Comparator - 1 bit and 4-bit using gates.
14. BCD- Adder.
15. Microprocessor- 8 bit Addition, Subtraction, Multiplication and Division.
16. Microprocessor- Conversion from Decimal to Octal, Hexa Decimal Number System.
17. Traffic Control System using Microprocessor.
18. Microcontroller- Addition and Subtraction.
19. Microcontroller- Multiplication and Division.
20. C-Program- Solving equations by Newton – Raphson method.
21. C-Program- Solving equations by Successive Approximation method.
22. C-Program- Numerical Differentiation by Euler's method.

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 4
Hours/Week : 6
Semester : 3

Code : S3PPHEL3A
Medium : English

(For students admitted from 2018-2019)

THIN FILM PHYSICS

Unit I: INTRODUCTION

Thin films: an over view – Advantages of thin film devices over their bulk counterparts-Film growth stages-Nucleation stage - Island structure stage-Coalescence stage- Channel stage and continuous film stage - Crystal structure and imperfections: classification of crystals - crystal lattice and unit cell – Crystal planes and Miller indices – Crystal system and symmetry- Interplanar spacing-crystal imperfections-point defects- line defects-surface defects-volume defects-colour centers

Unit II : DEPOSITION TECHNIQUES

Vacuum evaporation - Evaporation theory - Rate of evaporation - Hertz-Kundsen equation - Free evaporation and effusion - Evaporation mechanisms - Directionality of evaporating molecules - vapour sources - wire and metal foils - Electron bean gun - flash evaporation - sputtering - Glow discharge sputtering - Bias sputtering - Reactive sputtering - Triode sputtering - Magnetron sputtering - Ion beam sputtering - CVD - PLD. Film thickness measurements - Optical methods - FECO - Fizeaus technique - Ellipsometry - Vamfo. Other techniques - Electrical - Mechanical - Micro-balance - Quarts crystal monitor.

Unit III: VACCUM, STRUCTURAL AND ELECTRICAL PROPERTIES

High vacuum production – Mechanical pumps – Diffusion pumps Cryogenic pumps – Cryosorption pumps - Getter pumps – ion pumps.

Structrual properties: X-ray diffraction- Powder diffraction technique for polycrystalline thin films-Determination of structural parameters.

Electrical properties: Electrical resistivity- Sheet resistance - Four point probe method –van der Pauw technique - Hall probe method to find mobility, Carrier concentration and resistivity.

Unit IV: PROPERTIES

Dielectric properties Simple electrical theory DC conduction mechanisms. high and low field conduction temperature dependence AC conduction mechanisms relaxation peaks frequency dependent phenomena thin film devices resistor capacitors active devices thin film solar cells thin film in integrated circuits.

Unit V: APPLICATIONS Discrete resistive components- Thermistor, Varistor, Strain gauge element-Capacitor- Hall probe element- Active devices- Micro electronics, Integrated circuits and other applications-Interference filters- Anti -reflection coatings –spintronics -Thin film gas sensors- Solar cell applications.

BOOKS FOR STUDY AND REFERENCE

1. Thin film fundamentals- A. Goswami (New Age, New Delhi, 1996)
2. Thin film phenomena- K. L.Chopra (Robert E. Krieger Publishing company, 1979)
3. Hand book of thin film technology - L. T. Maissel & Gang (McGraw Hill, New York, 1983)
4. Hand book of Deposition technologies for films and coatings- R. F. Bunshah (Noyes Publications, New Jersey, USA, 1994)
5. Introduction to thin films- K. Ravichandran, K. Swaminathan, B. Sakthivel (Research India Publication, New Delhi, 2013)
6. S. Dushman and J.M. Lafferty, Scientific Foundations of Vacuum Technology
7. D.R. Lamp, Electrical conduction mechanisms in thin insulating films: Mathew & Co. (1967)
8. Joy George , Preparation of Thin Films, Marcel Dekker, NY(1992)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOU
THANJAVUR-613 005

Credits : 4
Hours/Week : 6

Code : S3PPHEL3B
Medium : English

(For students admitted from 2018- 2019)

COMPUTATIONAL PHYSICS

Unit 1: INTRODUCTION & SCHRODINGER EQUATION

What is computational Physics. Some computational problems in Classical and Quantum Physics. Basic programing techniques

Solution of the generalized eigenvalue problem, perturbation theory and variational calculus.

Unit 2: INTEGRAL & DIFFERENTIAL EQUATIONS

Calculation of scattering cross section (a) quantum scattering with a spherically symmetric potential

Classical electrons in crossed electric and magnetic fields

Laplaces equation, wave equations , diffusion equation and Maxwells equations

Unit 3: MOLECULAR DYNAMICS SIMULATIONS

Integration methods, molecular dynamics simulations at different ensembles. Langevin dynamics simulations for brownian motion. Quantum molecular dynamics for hydrogen molecule.

Unit 4: THE MONTE CARLO METHOD

Monte carlo simulations with various ensembles. Estimation of energy and chemical potential. Ising model . Quantum Monte Carlo.

Unit 5: MATRIX METHODS

Transfer matrix methods for spin chains. Finite element method for partial differential equations.

Books for study:

1.Computational Physics. J. M. Thijssen , Cambridge - 2007.

2. Understanding Molecular simulations , D. Frenkel and B. Smith, Academic press, 2002.

3. Steven E Koonin and D C Meredith, Computational Physics [fortran version], Perseus Books.

4.Numerical Recipes, Cambridge Univ Press

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	: 4	Code	: S3PPHEL3C
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

SIGNAL PROCESSING

UNIT-I

Signals, noise and their classification. Continuous and discrete signals; discretization of continuous signals, sampling theorem, aliasing. Reconstruction of a signal from its samples-Gibb's phenomenon.

UNIT-II

Laplace transform and inverse Laplace transform and its applications.Review of Complex exponential Fourier series, Fourier integral.Review of Fourier transform and its properties, energy and phase spectra.Review of Fourier transforms of some commonly used functions, utility of domain transformation.

UNIT-III

Inverse Fourier transforms; use of one and two dimensional Fourier transforms in solving various problems, radial and angular spectra. Hankel transform and Hilbert transforms their properties, the concept of analytic signal and its uses.

UNIT-IV

Z transforms: definition and types, Z transforms of causal and non-causal sequences, properties of Ztransforms and the region of convergence, application of Z transform & inverse Z transform. Concepts and application of Poles and Zeroes for Instrumentations.Introduction to wavelet transforms and its applications.

UNIT-V

Digital filters: Basic concepts of Transfer function, Impulse response. Types of filters, ideal filters; design of Martin Graham, Butterworth and Chebyshev filters. Various applications of filters. Inverse filtering: Wiener filters, deconvolution-predictive and its applications. Homomorphic filtering, ceptsral analysis and its applications. Processing of random signals and its applications.

Text Books:

1. Naidu, P. S., and Mathur, M. P., Analysis of Geophysical Potential Field: A Digital Signal Processing Approach: Elsevier
2. Rawat, T K, Signals and Systems, Oxford University Press.
3. Gubbins D., Time Series Analysis and Inverse Theory for Geophysicists,Cambridge University Press.
4. Lathi, B.P. Signal Processing and Linear Systems. Oxford University Press.

Reference Books:

1. Baskakov, S., 1986, Signals and Circuits, Mir Publishers
2. Kanasewich, E. R., 1975, Time Sequence Analysis in Geophysics, The University of Alberta Press
3. Robinson, E. A., 1981, Time Series Analysis and Application: D. Reidel
4. Dinz, P S R, da Silva, A B and Netto S L, Digital Signal Processing(System Analysis and Design), Cambridge University Press.
5. Proakis, J G and Manolakis D G, Digital Signal Processing(Principles, Algorithms and Applications), PHI Publication(3rd Edition)
6. Jordan, D.W. & Smith, P.Mathematical Techniques(4th Edition) Oxford University Press(An introduction for the engineering,physical and mathematical sciences)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits	: 5	Code	: S4PPH10
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

THEORETICAL PHYSICS

Unit : 1 ASTROPHYSICS

Structure of solar system – Sun, Planets, Moon and Astroids – motion of comet – Halley comet - Solar activity - Origin of Solar System – Classification of Stars – Luminosity, Brightness, Colour , spectral type and temperature of Stars – Stellar evolution – Sources of Stellar Energy – Proto star - final stages of Star – Red Giant, White dwarf , Neutron Star and Black Hole – Chandrasekkar limit – HR diagram – Types of Galaxy.

Unit : 2 COSMOLOGY

Origin of the Universe – Big Bang Theory –Expanding Universe – Hubbles Law – red shift -Microwave background radiation – Pulsars, Super Nova – Radio Astronomy – Aperture synthesis – Synchrortron radiation – 21 cm spectral line of hydrogen - Cosmic rays - Cosmological models – Newton, Einstein and Friedman model (only concepts)– de sitter solution - Pulsating Universe

Unit 3: NON LINEAR DYNAMICS

Phase space – Linear, damped and non linear systems – fixed points – types – KdV equation – Solitary Waves – Basic ideas of tsunami – Logistic map. – bifurication - choas

Unit 4: SIMULATION PHYSICS (COMPUTATIONAL PHYSICS)

Random numbers – Random walk problems – Types of RW – biased RW, unbiased RW and self avoiding RW – ising model – Cellular automata –percolation – Manto Carlo basic ideas – Brownian motion.

Unit 5: QUANTUM FIELD THEORY

Dirac Equation in covariant form – Gama matrices - properties – classical field theory – Noether's theorem – second quantization – scalar field quantization – Dirac field quantization.

BOOKS FOR STUDY

1. Astrophysics : Stars and Galaxies – K. Abhyankar , University press (2002)
2. Structure of the universe – J. V. Narliker ,Oxford University Press (1977)
3. Chaos and Non Linear Dynamics - Robert C. Hilbond., Oxford university press (2010)
4. An Introduction to Computer simulation methods – Harvey Gould , Jan Tobochnik & Wolfgang Christain , Addision wesley (1988)
5. Quantum field theory – Ryder , Cambridge university press (1985)
6. Advance Quantum Theory anf Fields – S.L.Gupta et. al. , S.Chand (1982)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits	**: 5**	**Code**	**: S4PPHP4**
Hours/Week	**: 6**	**Medium**	**: English**

(For students admitted from **2018- 2019**)

PHYSICS PRACTICAL – IV

(Choose Any Fifteen experiments)

1. Operational Amplifier- Schmidt trigger (IC 555 Timer).
2. Operational Amplifier-Sine Wave- Wien's Oscillator.
3. Operational Amplifier-Square, Triangular and Ramp Wave Generator.
4. Operational Amplifier-Solving Simultaneous equations.
5. Half Subtractorr and Full Subtractor using NAND gates.
6. Demultiplexer-(1 to 4, 1 to 8, 1to 16).
7. Study of Flip Flops.
8. Simplification of Boolean expressions by Karnaugh Map method.
9. D/A Conversion- Resolution Linearity and Dual Slope.
10. Asynchronous Counter- Up Counter and Down Counter.
11. Study of 0-99 Counter (IC 7490).
12. Digital Comparator – 1 bit and 4 bit using IC's.
13. 9's Complement Subtractor.
14. Microprocessor- 16 bit Addition, 1's complement and 2's ComplementSubtraction.
15. Microprocessor- Conversion from Octal, Hexa to Decimal number system.
16. Study of DAC interfacing (DAC 0800).
17. Microprocessor- Contol of Stepper Motor.
18. Microcontroller- Smallest and Biggest.
19. Microcontroller- Ascending and Descending.
20. C-Program- Numerical Integration by Simpson's method.
21. C-Program- Numerical Integration by Trapezoidal rule.
22. C-Program- Numerical Differentiation by Runge- Kutta (II Order) method

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE.
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4
Code : S4PPHPW
Hours/Week : 6
Medium : English
Semester : 4

PROJECT WORK

Credits	**: 4**	**Codes**	**: S4PPHEL4A**
Hours/Week	**: 6**	**Medium**	**: English**

(For students admitted from 2018-2019)

APPLIED PHYSICS

Unit 1: RENEWABLE ENERGY

Types of renewable energy – merits and demerits - Solar power generation – Solar pond - Solar collector – Parabolic dish - Central tower – Solar Photovoltaic cell – Solar cell fundamentals – characteristics – classification – Second and third generation solar cells .

Unit 2: ROCKET AND SATELLITE

Escape velocity – principle of Rocket - (Tsiolkovsky) rocket Equation – single stage and multi stage rocket – rocket propellents - orbital velocity - Geostationary Satellite - launching of satellite into the orbit – trajectory adjustments - types of satellite – space shuttle – space station – inter planetary space probes – trajectory of space probes - Exploration of solar system - India's space programme.

Unit 3: PHENOMENA OF EARTH

GEOPHYSICS

Motion of object in rotating non inertial frame - Effect of Rotation of Earth on the motion of river and cyclone

Earth quake and seismic waves – Richter magnitude scale - Continental drift theory - plate tectonics – evidences

ATMOSPHERIC PHYSICS

Formation of cloud – lightning and thundering – relative velocity between them- cyclones – tornodo

Climate change on earth – weather forecasting – El nino phenomena - upper atmosphere structure –ionosphere – wave propogation in ionosphere - Geoinformatics

Unit 4: BIOPHYSICS

Blood velocity and pressure – eye and ear physical mechanism - Molecular forces in biological structure – mechanism of muscular contraction – protein folding – neuro biophysics – information exchange through nerves.

Unit 5: PLASMA PHYSICS

Introduction – Debye's shield – plasma parameter – application of plasma physics – single particle motion – motion of charged particle in magnetic field – plasma as a fuel – fluid equation of motion – waves in plasma.

BOOKS FOR STUDY

1.Renewable energy sources & emerging technologies – D.P. Kothari, K. C. Singal & Rakesh Rajan , PHI (2011)

2.Astronantics : The physics of space flights -Ultrich Walter , Wile (2008)

3.Text book of physical Geology – G. P. Mahapatra , CBS (2016)

4.Basics of atmospheric science – A. Chandrasekar, PHI. (2016)

5.Essential biophysics – P. Narayanan ,New age international (2008)

6.Introduction to biophysics – Pranab Kumar Banarjee , S. Chand (2011)

7.Text book of plasma physics – Suresh Chandra , CBS (2010)

8.Plasma physics by S. N. Goswami , News central (2011)

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 4
Hours/Week : 6
Semester : 4

Code : S4PPHEL4B
Medium : English

(For students admitted from 2018-2019)

NANO PHYSICS

Unit 1: NANOSCALE & SYNTHESIS ROUTES :

Nanotechnology – Emergence of Nanotechnology - Size - properties - History and Scope -Classification of nanostructured materials - Challenges and Future prospects.

Top down and bottom up approaches: Gas phase condensation – Vacuum deposition - Physical vapor deposition (PVD) - chemical vapor deposition (CVD) - Sol-Gel- Ball milling –spray pyrolysis - dip-pen nanolithography.

Unit 2: NANO MATERIALS & PROPERTIES:

Carbon Nanotubes (CNT) - Metals (Au, Ag) - Metal oxides (TiO2, CeO2, ZnO) - Semiconductors (Si, Ge, CdS, ZnSe) - Ceramics and Composites - Dilute magnetic semiconductor- Biological system - DNA and RNA - Lipids - Size dependent properties - Mechanical, Physical and Chemical properties.

Unit 3: NANOMAGNETISM

Magnetic quantities and units, magnetism of free atoms and ions, Hund's rules and the Landé factor, localized electron magnetism in solids, itinerant electron magnetism in metals, band theory of magnetism, indirect exchange interaction, magnetic anisotropy, magnetization and magnetic materials, domains, magnetic energies (magnetostatic energy, magnetocrystalline energy, magnetostrictive energy), domain walls, demagnetizing field, magnetization process.

Unit 4: CHARACTERIZATION TECHNIQUES:

Principles of electron microscopes - Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy (TEM) - Scanning Probe Microscopy (SPM) - Principle and working of Atomic Force Microscopy (AFM) and Scanning tunneling microscopy (STM).

UV-vis-NIR spectrophotometer- Transmission and absorption spectra of thin films- Optical band gap - absorption co-efficient- Photoluminescence spectroscopy . VSM-SQUID.

Unit 5: APPLICATIONS:

Nano electronics-Energy -Nanosensors –Nano medicines –Nanotribology –NEMS – MEMS - Defence and space Applications.

Biosensor and nanobiosensor basic concepts, characterization, perception, Enzyme–metal NP hybrids for biosensing and for the generation of nanostructures, Biomolecule– semiconductor NPs for biosensing, Different types of nanobiosensors

Nanotechnology and food packaging, natural biopolymers, advantages of nanomaterials in food packaging applications

Nanotechnology in Agriculture, Precision farming, Smart delivery system, Insecticides using nanotechnology.

Books for study:

1.NANO:The Essentials-T. Pradeep TATA McGraw HILL, December 2006.

2.Nanotechnology –Booker and Boysen –Wiley and Sons 1st Edition 2006.

3.Modern magnetic materials, Robert C. O'Handley, John Wiley & Sons Inc., 2000.

4.Introduction to magnetic materials, Cullity and Graham, John Wiley & Sons Inc., 2009.

5.Ehud Gazit (2007) Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology. Imperial college Press

6. Challa S., S. R. Kumar, J. H. Carola (2006) Nanofabrication towards biomedical application: Techniques, tools, Application and impact. John Wiley and sons.

7. Harry F. Tibbals (2010) Medical Nanotechnology and Nanomedicine. CRC Press

8. K.E.Drexler, Nano systems, Wiley, 1992.

9. G.Cao, Naostructures and Nanomaterials: Synthesis, properties and applications, Imperical College Press, 2004.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

HOD Signature

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)

Credits	: 4	Code	: S4PPHEL4C
Hours/Week	: 6	Medium	: English

(For students admitted from 2018-2019)

HIGH ENERGY PHYSICS

Unit-I: Conservation laws and symmetries

Review of concepts of spin, parity, isospin in particle physics, example of pion; charge conjugation invariance, G-parity, time reversal, CP-violation and CPT theorems, introduction to symmetries: discrete and continuous symmetries, examples, Young's tables and their relation to group theory, symmetry groups O(3), SU(2), SU(3) and SU(6), applications of symmetry groups to hadron spectroscopy: meson mixing, mass formulae.

Unit-II: Quark model

Introduction to constituent quark model, quantum number of quarks & valence quark contents of hardrons, introduction to quarkonia (charm and bottom systems), simple applications to hadron phenomenology, e.g., unitary spin & spin hadron wave function of mesons and baryons, baryon masses.

Unit-III: Electromagnetic interactions

Low energy electron nucleon scattering and form factors, electromagnetic form factors of nucleons, deep inelastic structure functions and introduction to parton model, gauge invariance; local, global transformations and charge conservation, Noether's Theorem.

Unit-IV: Weak and strong interactions

Weak: Introduction to four fermion Fermi theory, Fermi transitions. Gamow-Teller transitions, development of V-A theory, weak neutral current and Glashow-Iliopoulos-Maiani (GIM), neutrino-nucleon scattering, electroweak unification.

Strong: Introduction to gauge field theories, including non-abelian gauge field Yang-Mills theory, elements of QCD, Feynman diagrams.

Unit-V: Unification schemes

Global symmetry breaking and Goldstone bosons, mass term, local symmetry breaking and the Higgs boson, introduction to Glashow-Weinberg-Salam model, introduction to the Standard Model and Lagrangian.

Books for study and reference:

1. D. Griffiths, Introduction to Elementary Particles, 2nd Ed., Wiley VCH, 2008.
2. W.N. Cottingham, D. A. Greenwood, An Introduction to the Standard Model of Particle Physics, 2nd Ed., Cambridge University Press, 2007.
3. D.H. Perkins, An Introduction to High Energy Physics, 4th Ed., Cambridge University Press, 2000.
4. I.S. Hughes, Elementary Particles, 3rd Ed., Cambridge University Press, 1996.
5. F.E. Close, Introduction to Quarks and Partons, Academic Press, London, 1981.
6. M.P. Khanna, Introduction to Particle Physics, 3rd Ed., Prentice-Hall of India, New Delhi, 2004.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005

Credits : 4
Hours/Week : 6

Code : S4PPHEL5A
Medium : English

(For students admitted from 2018-2019)

Materials Science

UNIT-I

Introduction to Materials

Perspectives of material science -properties, classification and selection of materials- Factors affecting properties and selection of materials- Structure property relationship - Crystal structure of metallic elements - Nacl, Diamond, Silica - Imperfections in crystals-line, point, surface, volume- Effect of crystal imperfections.

UNIT-II

Electrical materials

Different types of conducting materials- Variation of electrical property due to mechanical stress- Relaxation time, collision time, mean free path- Different types of electric polarization- Frequency and temperature effect on polarization- Dielectric loss and breakdown- Properties and types of insulating materials- Ferroelectric materials.

UNIT-III

Thermal, Optical and Magnetic materials

Objectives of Heat treatment- Process- Types of heat treatment- Normalizing- Annealing- Tempering- Carburizing- Surface hardening.

Optical properties of metals and nonmetals- Application of optical phenomena- Display devices and display materials- Optical fiber materials.

Magnetic materials- Types- Influence of temperature on magnetic behavior-Hysteresis-Soft and Hard magnetic materials- High energy hard magnetic materials- Magnetic storage.

UNIT-IV

Mechanical properties

Types of mechanical properties -elasticity, Plasticity, Hardness, Strength, Malleability- Factors affecting mechanical properties- Nondestructive testing (NDT)-Elastic of plastic deformation- Comparison - Tensile- Stress- Strain curve-Plastic deformation by slip- dislocation- types edge and screw – Comparison- Burger vector- Multiplication of dislocation during deformation- Creep- Mechanism- fracture- Ductile of brittle fracture - method of production against fracture- Fatigue-Phase diagram- Gibb's phase rule- Interpretations of phase diagram- Iron- Carbon equilibrium diagram.

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

UNIT-V

Advanced applications and materials

Metallic glasses- Fiber reinforced metals (FRM) - Biomaterials- Historical development -Classifications - Ceramics (Applications only) – High temperature materials- Nuclear engineering materials- Nano materials (CNT only)- Advantages- SMART materials- Conducting polymer materials- Applications- Radioactive materials.

Books for Study and References:

1. Materials Science and Engineering – V.Raghavan - A First Course – Fifth Edition – (2011) – PHI Learning Private Limited – Eastern Economy Edition.

2. Materials Science - M. Arumugam – Anuradha Publications – ISBN -81-87721-05-7, (2014).

3. Material Science and Processes - R. S. Khurmi, R. S. Sedha – S.Chand – (1991) - ISBN-10: 0906216001

4. Material Science and Metallurgy – O.P.Khanna - Dhanpat Rai Publications -ISBN: 9789383182459 – Revised edition – (2017).

5. Material Science - S. L. Kakani , Kakani Amit - New Age International Pvt Ltd Publishers – (2010) - ISBN-10: 8122430856 .

References:

1. Material Science - G. K. Narula, K. S. Narula, V. K. Gupta - Tata McGraw-Hill Education - (1989)

2. Material Science and Engineering – An Introduction - William D. Callister, Jr. – John Wiley and Sons Inc., (2007).

3. Material Science and Engineering – I.P.Singh, Subash Chander, Rajesh K.Prasad, - Jain Brothers – 12th Edition - (2010).

4. The Physics and Chemistry of Materials - Joel I. Gersten, Frederick W. Smith John Wiley and Sons, Scientific Publishers- (2001)- ISBN: 978-0-471-05794-9

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)

Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)

Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005.

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4
Hours/Week : 6

Code : S4PPHEL5B
Medium : English

(For students admitted from 2018-2019)

ROBOTICS

Unit 1: INTRODUCTION & ELEMENTS OF ROBOTS

Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.

Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

Unit 2: KINEMATICS OF SERIAL & PARALLEL ROBOTS

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems.

Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

Unit 3: MOTION PLANNING AND CONTROL

Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

Unit 4: MODELING AND CONTROL OF FLEXIBLE ROBOTS

Models of flexible links and joints, Kinematic modeling of multi-link flexible robots, Dynamics and control of flexible link manipulators, Numerical simulations results, Experiments with a planar two-link flexible manipulator.

Unit 5: ADVANCED TOPICS IN ROBOTICS

Introduction to chaos, Non-linear dynamics and chaos in robot equations, Simulations of planar 2 DOF manipulators, Analytical criterion for unforced motion. Gough-Stewart platform and its singularities, use of near singularity for fine motion for sensing, design of Gough-Stewart platform based sensors. Over-constrained mechanisms and deployable structures, Algorithm to obtain redundant links and joints, Kinematics and statics of deployable structures with pantographs or scissor-like elements (SLE's).

Books for study:

1.Robotics: Fundamental Concepts and Analysis, Oxford University Press, Second reprint, May 2008.
2.S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
3.Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
4.P.N.Rao, "CAD/CAM: Principles and Applications", Tata McGraw Hill, 2010.
5.P.N.Rao, N.K. Tewari & T.K. Kundra, "Computer Aided Manufacturing", Tata McGraw Hill, 2001.
6.Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
7.Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)
Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)
Part – C 3 X10=30 Marks Answer Any Three Questions (Three out of Five – One question from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.

Credits : 4 Code : S4PPHEL5C
Hours/Week : 6 Medium : English

(For students admitted from 2018-2019)

ELECTIVE COURSE
NONLINEAR OPTICS

Unit I Lasers

Gas lasers – He-Ne, Ar+ ion lasers – Solid state lasers – Ruby – Nd:YAG, Ti sapphire –Organic dye laser – Rhodamine – Semiconductor lasers – Diode laser, p-n-junction laser and GaAs laser.

Unit II Basics of Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light–Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching – Third harmonic generation – Terahertz -- Bistability –Self-focusing.

Unit III Multiphoton Processes

Two photon process – Theory and experiment – Three photon process – Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index -- Optical Kerr effect -- Foucault effect – Photorefractive, electronic and optic effects.

Unit IV Nonlinear Optical Materials

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline – Semiorganics – Thoreau complex – Laser induced surface damage threshold.

Unit V Fiber Optics

Step – Graded index fibers – Wave propagation – Fiber modes – Single and multimode fibers – Numerical aperture – Dispersion – Fiber bandwidth – Fiber losses -- Scattering, absorption, bending, leaky mode and mode coupling losses – Attenuation coefficient -- Material absorption.

Books for Study

1. K.R. Nambiar, *Lasers: Principles, Types and Applications* (New Age Inter-national Publishers Ltd, New Delhi, 2014).
2. B.B. Laud, *Lasers and Nonlinear Optics*, 3rd Edn. (New Age, New Delhi, 2011).
3. R.W. Boyd, *Nonlinear Optics*, 2nd Edn. (Academic Press, New York, 2003).
4. G.P. Agarwal, *Fiber-Optics Communication Systems*, 3rd Edn. (John Wiley, Singapore, 2003).

Books for Reference

1. W.T. Silvast, *Laser Fundamentals* (Cambridge University Press, Cambridge, 2003).
2. D.L. Mills, *Nonlinear Optics – Basic Concepts* (Springer, Berlin, 1998).

Question Paper Pattern

Maximum Marks:75 Marks **Exam Duration:3 Hrs**

Part - A 10 X2 = 20 Marks Answer ALL Questions (Two questions from each unit)
Part - B 5 X5 = 25 Marks Answer ALL Questions (Either or Type - Two questions from each unit)
Part – C 3 X10=30 Marks Answer Any Three Questions (One Questions from each unit)

HOD Signature

HEAD,
DEPARTMENT OF PHYSICS,
RAJAH SERFOJI GOVT. COLLEGE,
THANJAVUR-613 005

CONTROLLER OF EXAMINATIONS,
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.