CAUVERY COLEGE FOR WOMEN (AUTONOMOUS)
M.SC PHYSICS PROGRAMME STRUCTURE
UNDER CHOICE BASED CREDIT SYSTEM
(For the candidates admitted from the academic year 2020-2021)

Sem	Course	Title	Course Code	Ins. Hrs / Week	Credit	Exam Hrs	Marks		Total
							Int	Ext	
I	Core course -I	Mathematical Physics	19PPH1CC1	6	4	3	25	75	100
	Core course -II	Classical Dynamics and Relativity	19PPH1CC2	5	4	3	25	75	100
	Core course -III	Electronics	19PPH1CC3	5	4	3	25	75	100
	Core course -IV	Quantum Mechanics-I	19PPH1CC4	6	4	3	25	75	100
	Core Practical -I	Physics Practical – I (General and Electronics)	19PPH1CC1P	8	4	3	40	60	100
			TOTAL	**30**	**20**	-	-	-	**500**
II	Core course -V	Electromagnetic Theory	19PPH2CC5	6	5	3	25	75	100
	Core course –VI	Quantum Mechanics – II	19PPH2CC6	6	5	3	25	75	100
	Core Practical -II	Physics Practical – II (Microprocessor and C++ Programming)	19PPH2CC2P	8	4	3	40	60	100
	Elective Course -I	Microprocessor and Microcontroller	19PPH2EC1A	5	5	3	25	75	100
		Non- Destructive Evaluation Techniques	19PPH2EC1B						
	Elective Course -II	Numerical Methods and C++ Programming	19PPH2EC2A	5	5	3	25	75	100
		Biomechanics and Bio Physics	19PPH2EC2B						
	Extra Credit Course	To be fixed Later	To be fixed later	SWAYAM online course as per UGC Recommendations					
			TOTAL	**30**	**24**	-	-	-	**500**
III	Core course –VII	Statistical Mechanics	19PPH3CC7	6	5	3	25	75	100
	Core course –VIII	Solid State Physics	19PPH3CC8	6	5	3	25	75	100
	Core course –IX	Physics for competitive examinations	19PPH3CC9	5	5	3	-	100	100
	Core Practical -III	Physics Practical – III (General and Electronics)	19PPH3CC3P	8	4	3	40	60	100
	Elective Course -III	Crystal Growth and Thin Film Physics	19PPH3EC3A	5	5	3	25	75	100
		Material Characterization and Measurement Techniques	19PPH3EC3B						
	Extra Credit Course	To be fixed Later	To be fixed later	SWAYAM online course as per UGC Recommendations					
			TOTAL	**30**	**24**	-	-	-	**500**
	Core course –X	Nuclear and Particle Physics	19PPH4CC10	5	5	3	25	75	100
	Core Practical -IV	Physics Practical – IV (Electronics)	19PPH4CC4P	8	4	3	40	60	100
	Elective Course -IV	Nonlinear Optics	19PPH4EC4A	5	5	3	25	75	100

IV		Space Physics	19PPH4EC4B						
	Elective Course -V	Nanophysics	19PPH4EC5A	5	4	3	25	75	100
		Astrophysics	19PPH4EC5B						
		Project	19PPH4PW	7	4	-	-	-	100
	TOTAL			**30**	**22**	-	-	-	**500**
			TOTAL	**120**	**90**	-	-	-	**2000**

Project : 100 Marks

Dissertation : 80 Marks

Viva Voce : 20 Marks

Core Papers - 10

Core Practical - 4

Elective Papers - 5

Project - 1

Note:

1. Theory Internal 25 marks External 75 marks

2. Practical ” 40 marks ” 60 marks

3. Separate passing minimum is prescribed for Internal and External

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e. 30 marks)

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

Semester -I	Internal Marks : 25		External Marks : 75			
Course Code	Course Title	Category	L	T	P	Credit
19PPH1CC1	MATHEMATICAL PHYSICS	CC-1	90	6	-	6

Objectives

- To provide a strong mathematical foundation in vector calculus, matrices and differential equations
- To enhance problem solving skills and to give the ability to formulate, interpret and draw inferences from the mathematical solutions

Course Outcomes

After successfully completing the course, the student will be able to

CO Number	CO Statement	Knowledge level
CO1	Solve the problems from the matrices and tensors calculus and its applications	K2
CO2	Demonstrate accurate and efficient use of group theory	K2
CO3	Acquire a sound knowledge in linear vector space which will be necessary to pursue other areas in physics.	K3
CO4	Apply the complex analysis techniques to solve problem in physics, engineering and other mathematical contexts.	K3
CO5	Understand the nature and applications of the Sturm–Liouville problem and analyze properties of special functions by their integral representations and symmetries.	K3

Mapping with programme outcomes

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

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

Syllabus

UNIT -I: VECTOR ANALYSIS **18hrs**

Vector integration – Line integral – Path independence – Exact differential – Surface integral – Flux – Volume integral – Green's theorem – Stokes' theorem – Divergence theorem – Orthogonal curvilinear coordinates – Unit vectors in curvilinear coordinate system – Arc length and volume element – The gradient, divergence, curl and Laplacian in cylindrical and spherical polar coordinates.

UNIT-II: MATRIX THEORY AND GROUP THEORY **18 hrs**

Matrix Theory: Characteristic equation of a matrix – Matrix algebra – System of linear equations –Types of matrix – The Inverse of a matrix – Eigenvalues and eigenvectors – Cayley–Hamilton theorem -Reduction of a matrix to diagonal form – Jacobi method – Sylvester's theorem.

Group Theory

Basic definitions – Multiplication table – Subgroups, cosets and classes – Point and space groups – Homomorphism and isomorphism – Reducible and irreducible representations -Formation of character table of C_{2v} and C_{3v} -Elementary ideas of rotation groups.

UNIT-III: TENSORS **18 hrs**

Tensors: Transformation of coordinates – summation convention – Kronecker delta - Contravariant, Covariant and mixed tensors – Rank of a tensor –Symmetric and anti-symmetric tensors – Inner and outer product - Contraction of a tensor – Quotient Law - Raising and lowering of suffixes – Metric tensor – Conjugate tensors – Christoffel symbols of first and second kind – Covariant derivatives.

UNIT-IV: COMPLEX ANALYSIS **18hrs**

Complex functions and variables – Condition for a function to be analytic– Complex integration – Cauchy's theorem – Cauchy's integral formula – Taylor expansion – Laurent series – Cauchy's residue theorem – Computations of residue – Evaluation of integrals using residues.

UNIT-V: SPECIAL FUNCTIONS **18hrs**

Sturm-Liouville problem - Basic properties – Need for studying Sturm-Liouville problems in physics – Specific examples - Legendre, Bessel, Hermite and Laguerre differential equations – Power series solutions –Polynomials – Generating functions – Rodrigue's formula - Recursion relations – orthogonality relations.

Text Books

S.No	Authors	Title of the book	Year of Publication	Publishers	Edition
1	B.D. Gupta	Mathematical Physics	2015	Vikas Pub	4th edition
2	A.K.Sexena	Mathematical Physics	2015	Narosa	2nd edition
3	A.W. Joshi	Matrices and Tensors in physics	2006	New Age	3rd edition
4	MurraySpiegel	Schaum Series of Complex Analysis	2009	McGraw-Hill	2nd edition
5	V.Balakrishnan	Mathematical Physics with Applications	2018	Indian Academy of Science	1st edition

Reference Books

S.No	Authors	Title of the book	Year of Publication	Publishers	Edition
1	H.K. Dass& RamaVerma	Mathematical Physics	2018	S. Chand	2nd edition
2	L.A.Pipes and L.R. Harvill	Mathematical Physics for Engineering	1970	McGraw-Hill	3rd edition

Pedagogy:

Chalk and Talk, Seminar, Assignment, Power point Presentation, Lecture with discussion and Quiz

Course Designer:

Dr.R.GAYATHRI

Semester -I	Internal Marks : 25	External Marks : 75				
Course Code	Course Title	Category	L	T	P	Credit
19PPH1CC2	CLASSICAL DYNAMICS AND REALTIVITY	CC – II	75	5	-	5

Objectives

- To demonstrate knowledge and understanding of the fundamental concepts of Classical dynamics
- To expose the students to the fundamentals of Lagrange's equation

Course Outcomes

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

CO Number	CO statement	Knowledge Level
CO 1	Demonstrate and understand the basic classical mechanics concepts related to discrete and continuous mechanical systems	K2
CO 2	Solve the mathematical Kepler problem	K3
CO 3	Explain the applications of Hamiltonian's equation	K5
CO 4	Determine the motion of a mechanical system using Lagrange-Hamilton formalism	K5
CO 5	Evaluate the Lagrange and Poisson brackets	K5

Mapping with programme outcomes

CO	PO1	PO2	PO3	PO4	PO5
CO 1	S	M	S	M	M
CO 2	S	S	S	S	S
CO 3	S	L	S	S	S
CO 4	S	M	S	L	S
CO 5	S	S	M	S	L

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

Syllabus

UNIT-I: LAGRANGIAN FORMALISM **15 Hrs**

D' Alembert's principle and Lagrange's equation- Problem: Free particle in a system - Atwood's machine – Time dependent constraint - bead sliding on a rotating wire - Hamilton's principle - Lagrange's equation of motion from Hamilton's principle - conservation theorems and symmetry properties.

UNIT-II: CENTRAL FORCE PROBLEMS **15 Hrs**

Equations of motion and first integrals - The equivalent one - dimensional problem and classification of orbits - The Kepler problem: Inverse square law of force - Laplace - Runge - Lenz Vector – Scattering in a central force field - Scattering problem to laboratory coordinates and centre of mass frames.

UNIT-III: HAMILTON'S FORMULATION **15 Hrs**

Cyclic coordinates - Hamilton's canonical equations of motion - Hamilton's equations from variational principle – the principle of least action - Application - canonical transformations- Infinitesimal constant transformations- Lagrange and Poisson brackets - Hamilton - Jacobi method - Action angle variables - Kepler problem in action angle variables.

UNIT-IV: RIGID BODY DYNAMICS AND OSCILLATORY MOTION **15 Hrs**

Euler angles - Moments and Products of inertia - Euler's equations - Symmetrical top - Applications - Theory of small oscillations and normal modes - Frequencies of free vibration and normal coordinates - Linear triatomic molecule.

UNIT -V: RELATIVISTIC MECHANICS **15 Hrs**

Algebra of tensors - Quotient law - Fundamental tensor - Cartesian tensors - four vectors in special theory of relativity - Lorentz transformations in real four dimensional spaces, Covariant four dimensional formulations - force and energy equations in relativistic mechanics - Lagrangian and Hamiltonian formulation of relativistic mechanics.

Text Books

S. No.	Authors	Title of the book	Publishers	Year of Publication	Edition
1	Herbert Goldstein	Classical Mechanics	Narosa Publishing House, New Delhi	2001	II
2	A.W. Joshi	Matrices & Tensors in physics	Wiley Eastern, New York	1995	Revised
3	N.C. Rana and P. S Joag	Classical Mechanics	Tata McGraw Hill, New Delhi.	1998	-

Reference Book

S. No.	Authors	Title of the book	Publishers	Year of Publication
1	Gupta, Kumar, Sharma	Classical Mechanics	Pragati Prakashan	2012

Pedagogy

Lecture, Seminar, Assignment, Power point presentation

Course Designers

1. **Dr. M. KAVIMANI**

Semester -I	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH1CC3	**ELECTRONICS**	**CC - III**	**75**	**5**	**-**	**4**

Objectives

- To understand the working of advanced semiconductor devices and digital circuits and the utility of OP-AMP
- To learn the basics of integrated circuit fabrication, applications of timer IC-555 and building block of digital systems.

Course Outcomes

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

CO number	CO statement	Knowledge level
CO1	Understand the concepts of semiconductor devices	K2
CO2	Identify the logic and develop counters	K3
CO3	Examine the concepts of operational amplifier to solve differential and simultaneous equations	K4
CO4	Evaluate the problem related to semiconductor devices, digital and oscillator circuits	K5
CO5	Recommend projects in electronics relevant to industrial and R &D needs	K5

Mapping with programme outcomes

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

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

Syllabus

UNIT-I : SPECIAL DEVICES, SENSORS AND TRANSDUCERS 15 hrs

Device construction and characteristics: MOSFET, UJT, Gunn diode, IMPATT diode, SCR - Optoelectronic devices: Solar cells, photo-detectors, and OLEDs Sensors and transducers: temperature, pressure, sound, magnetic field, motion, flow– measurement and control.

UNIT II : OPERATIONAL AMPLIFIER 15 hrs

Characteristics of an op – amp – inverting and non inverting amplifier – adder, subtractor, differentiator – integrator – active filters – analog computation – Design of Op-Amp low pass – high pass filters – voltage comparator – Wave form generators: Phase shift and Wein's Bridge Oscillator – Schmitt trigger –V to I and I to V converter- DAC – design of Binary weighted and R-2R ladder – ADC single, dual slope – SAR method

UNIT III : IC FABRICATION AND IC 555 TIMER 15 hrs

Basic monolithic ICs – epitaxial growth, masking and etching – Diffusion of impurities – monolithic transistors – integrated diodes – resistors and inductors –monolithic circuit layout – metal semiconductor contact. IC 555 Timer – Functional diagram of 555 timer – Astable multivibrator – Monostable multivibrator – Voltage Controlled Oscillator (VCO).

UNIT-IV: COMBINATIONAL AND ARITHMETIC LOGIC CIRCUIT 15 hrs

Analysis of Combinational logic circuits – Quine - McCluskey minimization method – 1 of 16 Decoder – BCD to seven segment decode driver – Totallizing counter – Encoder – 8 input priority encoder – 16 line to 1 line multiplexer – Demultiplexer – 1 to 16 Demultiplexer – controlled inverter – half adder/subtractor – 2's complement – adder – subtractor – one digit BCD adder and subtractor using IC7483 – serial and parallel adder units – Arithmetic logic unit.

UNIT - V: SEQUENTIAL CIRCUIT COMPONENTS 15 hrs

Introduction to sequential circuits - Latches and Flip Flop: SR latch – Timing problems and clocked SR latches - JK latch - Master slave latch - Delay Flip Flop - T Flip Flop - Flip Flop excitation requirements - Registers: Serial load shift registers - Parallel load shift register - Parallel to serial conversion - Universal shift registers.

Text books

S.No	Author name	Title of the book	Publisher name	Year of Publication	Edition
1	Robert Boylestad and Louis Nashelsky	Electronic Devices and Circuit Theory	Prentice Hall New Jersey	2016	Seventh edition
2	L. Floyd	Electronic Devices	Pearson Education, New York	2004	Third edition
3	S. Salivahanan, N. Suresh Kumar	Electronic devices and Circuits	Tata McGraw Hill,	-	-
4	Victor P. Nelson	Digital logic circuit analysis and design	Prentice Hall	1995	Second edition
5	J. Millman, C. Halkias and C.D. Parikh	Integrated Electronics, Analog and Digital Circuits and Systems	TATA McGraw Hill publications, New Delhi,	2010	Latest edition

Reference books

No.	Author name	Title of the book	Publisher name	Year of Publication	Edition
1	R.L. Geiger, P.E. Allen and N.R Strader	VLSI Design Techniques for Analog and Digital circuits	McGraw--Hill, Singapore	1990	First edition
2	D. Roy Choudhury and S.B. Jain	Linear Integrated Circuit	New Age International Publications, New Delhi	1996	Second edition
3	D. Chattopadhyay and P.C. Rakshit	Electronics Fundamentals and Applications	New age international Publications, New Delhi.	2010	Fourth edition

Web Resources:

1.http://www.analog.com/en/education/education-library/tutorials/analog-electronics.html

2. https://www.tutorialspoint.com/digital_electronics/index.asp

Pedagogy

Chalk and Talk , Lecture, Seminar, Assignment, power point presentation

Course Designer

Dr.K.KANNAGI

Semester -I	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH1CC4	**QUANTUM MECHANICS -I**	**CC-IV**	**90**	**6**	**-**	**4**

Objectives

- To learn the theoretical methods of quantum mechanics
- To understand their applications to microscopic systems

Course Outcomes

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

COs	CO Statement	Knowledge Level
CO1	Explain the Time dependent Schrödinger equation	K2
CO2	Solve Commutation relations	K3
CO3	Examine the abstract formalism	K4
CO4	Compare the abstract and matrix representation	K5
CO5	Conceive the angular momentum	K6

Mapping with programme outcomes

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

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

Syllabus

UNIT-I **18 hrs**

SCHRÖDINGER EQUATION APPROACH

Time dependent Schrödinger equation (free particle in one dimension) - Generalization to three dimension - Normalization and probability interpretation- Non-normalizable wavefunction and Box normalization - Expectation values: Ehrenfest theorem - Conditions on the wave function

APPLICATIONS

Particle in a square well potential - Solution of wave equation in bound states - Energy Eigenvalues - Energy Eigenfunctions - Square potential barrier: Quantum mechanical tunnelling - Reflection at potential barrier and walls-Linear harmonic oscillator (Schrödinger method) -The free particle - Hydrogen atom - Deutron

UNIT -II ABSTRACT FORMALISM I **18 hrs**

Linear vector space - Bra and Ket notations - linear operator - Eigenfunctions - Eigenvalues - Hermitian operator- - Commutation relations- Their connection with Poisson Brackets of Classical Mechanics -Properties of Unitary and Hermitian operators- Postulates of quantum mechanics - Observables and their connection with Hermitian operators

UNIT- III ABSTRACT FORMALISM II **18 hrs**

Generalized uncertainty relation - Dirac's notation - Equation of motion - Momentum representation - Heisenberg method: Matrix representation of wavefunction - Matrix representation of operator-Properties of matrix element - Schrödinger equation in matrix form - Unitary transformation

UNIT -IV **18 hrs**

SIMPLE HARMONIC OSCILLATOR

Harmonic oscillator in Schrodinger representation - Properties of stationery states - Formulation of Harmonic oscillator problem in abstract notation – Eigen states and Eigenvalues of the Harmonic oscillator (Abstract operator approach) - Creation, Annihilation and number operators

UNIT-V - ANGULAR MOMENT **18 hrs**

Angular momentum operator - Commutations relations of Angular momentum - Eigenvalue and eigenfunction of L_2 and Lz - Eigenvalues of J_2 and Jz - Angular momentum matrices -Spin angular momentum – Addition of angular momentum- Clebsch Gordon Coefficients

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	P. M. Mathews and K. Venkatesan	A Text Book of Quantum Mechanics	Tata McGraw Hill, New Delhi	1987	Second edition
2.	G. Aruldhas	Quantum Mechanics	Prentice Hall of India	2009	Second edition
3.	A.Ghatak & S. Lokanathan	A Text Book of Quantum Mechanics	Tata McGraw Hill, New Delhi	1987	-
4.	Eugen Merzbacher	Quantum Mechanics	John Wiley & Son,Inc,Newyork	1998	Third edition

Reference Books

S. No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	V. Devanathan	Quantum Mechanics	Narosa Publishing House, New Delhi	2006	-
2.	L. Schiff	Quantum Mechanics	Tata McGraw Hill, New Delhi	2014	Fourth edition
3.	R. Shankar	Principles of Quantum Mechanics	Springer, New Delhi	2007	Second edition
4.	V.K. Thankappan	Quantum Mechanics	Wiley Eastern Ltd, New Delhi	-	Second Edition

Pedagogy

Chalk and talk , Lecture, Seminar, Assignment, power point presentation

Course Designer

Dr.R.MEENAKSHI

Semester -I	Internal Marks : 40	External Marks : 60				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH1CC1P	**CORE PRACTICAL - I PHYSICS PRACTICALS – I (GENERAL AND ELECTRONICS)**	**CP-I**	**-**	**-**	**8**	**4**

Objectives

- To determine certain physical constants
- To understand properties and characteristics and applications of electronic components and devices.

Course Outcomes

After successive completion of the course student will be able to

CO Number	CO Statement	Knowledge level
CO 1	Explain the basics of experimental physics.	K2
CO 2	Understand the fundamental physics behind many scientific discoveries through hands on experience.	K2
CO 3	Explore the concepts involved in the thermodynamic processes.	K3
CO 4	Verify experimentally the basic laws of physics.	K4
CO 5	Develop the skill in handling instruments.	K6

Mapping with programme outcomes

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

S – Strong; M – Medium; L - Low

LIST OF EXPERIMENTS

A. General Experiments

1. Determination of q, n, σ by elliptical fringes method.
2. Determination of Rydberg's constant.
3. Study of Hall effect in a semiconductor.
4. Michelson interferometer - Determination of wavelength of monochromatic source.
5. Charge of an electron by spectrometer.
6. Determination of e/m of electron by magnetron method.

B. Electronics Experiments

1. Construction of dual regulated power supply
2. Astable and monostable multivibrators using IC555
3. Design and study of Wein bridge oscillator using op-amp
4. Up/down counter using mod 10
5. Operation of shift register using SISO, SIPO, PIPO
6. Characteristics of UJT

Text books

S.NO	Author Name	Year of Publication	Title of the book	Publisher Name
1	C.C. Ouseph, U.J. Rao, V.Vijayendran	May 30, 2009	Practical Physics and Electronics	S.Viswanathan, Printers & Publishers Pvt Ltd
2	Dr.S.Somasundaram	2012	Practical Physics	Apsara Publications
3	Department of Physics, St.Joseph's College.		Practical Physics,(M.sc)	-

Pedagogy

Demonstration and Practical sessions

Course Designer

Dr S.GOWRI

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2CC5	**ELECTROMAGNETIC THEORY**	**CC – V**	**90**	**6**	**-**	**5**

Objectives

- To learn the theory for the field produced by stationary and moving charges.
- To study the charged systems and propagation of electromagnetic fields.

Course Outcomes

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

Co number	CO statement	Knowledge level
CO1	Summarize the fundamentals of Electrostatics and Magnetostatics	K2
CO 2	Identify the concept of Electrodynamic fields	K3
CO 3	Apply the concept of electromagnetic theory in electromagnetic waves	K3
CO 4	Categorize the transverse behaviour of electromagnetic waves in different geometrics of wave guides	K4
CO5	Evaluate electromagnetic wave equations for different propagating media and to determine the flow of energy and wave velocity	K5

Mapping with programme outcomes

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

S- Strong; M-Medium; L- Low

Syllabus

UNIT-I: ELECTROSTATICS **15 hrs**

Coulomb's law – The electric field – Continuous charge distributions- Field lines, Flux and Gauss's law – The Divergence of E – Applications of Gauss's Law – The curl of E – Electric potential - Poisson's and Laplace Equation - Potential of a localized charge distribution – Electrostatic Boundary conditions –Uniqueness theorems – Method of images – boundary value problems on spherical symmetry, cylindrical symmetry and plane symmetry.

UNIT-II: MAGNETOSTATICS **15 hrs**

The Lorentz Force Law – The Biot- Savart Law – The magnetic field of steady current - The Divergence and Curl of B – Applications of Ampere's Law – magnetic potential– from uniform surface current - of a long solenoid - torroidal coil – large parallel plate capacitor – magnetic field inside and outside a cylindrical wire - magnetic field inside and outside the slab -Magnetic vector potential – magnetostatic boundary conditions.

UNIT-III: FIELD EQUATIONS AND CONSERVATION LAWS **15 hrs**

Ohm's law -Faraday's law – induced electric field - Inductance – Energy in magnetic fields – Maxwell's equations in free space and linear isotropic media - Boundary conditions on fields at interface- continuity equations – Poynting's theorem - Potential formulation – Lorentz and Coulomb Gauge transformations – retarded potentials

UNIT-IV: ELECTROMAGNETIC WAVES **15 hrs**

Waves in one dimension – Reflection, transmission and polarization – The wave equation for E and B – monochromatic plane waves - Energy and momentum in EM waves – Propagation in linear media – Reflection and transmission at normal and oblique incidence EM waves in conductors – Absorption, dispersion and reflection at a conducting surface

UNIT-V: GUIDED WAVES, RADIATION AND HIGH FREQUENCY DEVICES **15 hrs**

Wave guides -TE and TM waves in a rectangular wave guide – The coaxial transmission line – Electric dipole radiation – Magnetic dipole radiation – power radiated by a point charge – Radiation reaction - radiation damping of a charged particle – Physical basis of the radiation reaction- High frequency devices: Klystron – Gunn diode oscillator

Text Books

S.No.	Author name	Title of the book	Publisher name	Year of Publication	Edition
1	Edward C, Jordan & Keith G., Balmain	Electromagnetic Waves and Radiating Systems	Pearson Education, New York	2015	2nd edition
2	D.Griffiths	Introduction to Electrodynamics	Prentice Hall of India, New Delhi	1999	3rd edition
3	Chopra Agarwal	Electromagnetic Theory, K.Nath and Co	John Wiley, New York	1996.	5th edition

Reference Books

S.No	Author name	Title of the book	Publisher name	Year of Publication	Edition
1	J.D.Jackson	Classical electrodynamics	Wiley-Eastern Ltd-New Delhi	1996.	3rd edition
2	Feynman	The Feynman Lectures in physics	-	-	The definitive edition
3	Gupta, Kumar, singh, , Pragati Prakashan	Electrodynamics	Prentice Hall of India, New Delhi,	2006.	7th edition
4	DR. SurekaTomar	CSIR – UGC / NET / JRF/SET Physical Sciences	Upkar Prakashan, Agra	2 016.	2nd edition
5	J.R . Reitz, F.J.Miford and R.W.Christy	Foundation of electromagnetic theory	-	-	-
6	Schaum	Schaum's outlines series: Electromagnetics3e(sie)	-	-	2nd edition

Pedagogy

Chalk and talk , Lecture, Seminar, Assignment, power point presentation

Course Designer

Dr.K.KANNAGI

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2CC6	**QUANTUM MECHANICS -II**	**CC-VI**	**90**	**6**	**-**	**5**

Objectives

- To learn the fundamental concepts of quantum mechanics
- To understand their applications to microscopic systems

Course Outcomes

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

COs	CO Statement	Knowledge Level
CO1	Explain the Time-independent perturbation theory	K2
CO2	Solve One dimensional Schrödinger equation	K3
CO3	Apply the scattering theory	K3
CO4	Compare the Time-dependent perturbation theory	K5
CO5	Conceive the relativistic quantum mechanics	K6

Mapping with programme outcomes

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

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

Syllabus

UNIT – I **18hrs**

TIME-INDEPENDENT PERTURBATION THEORY I

Perturbation theory for discrete levels - Equation in various orders- Non-degenerate levels - degenerate levels - Stark effect: Ground state of Helium - First excited state of Hydrogen atom - Two electron atoms

UNIT – II

TIME-INDEPENDENT PERTURBATION THEORY II **18 hrs**

Variational method: Upper bound on ground state energy - Application to excited states - Ground state of a two electron atom- Hydrogen molecule - WKB approximation: One dimensional Schrödinger equation with asymptotic solution-Solution near a turning point-WKB solution of the radial wave equation

UNIT – III

TIME-DEPENDENT PERTURBATION THEORY **18 hrs**

Perturbative solution for transition amplitude - Selection rule - First order and second transitions: Constant perturbation - Fermi's golden rule - Scattering by a particle by a potential - Harmonic perturbations: Amplitude for transition with change of energy - Transition induced by incoherent spectrum of perturbing frequencies

UNIT –IV **18hrs**

SCATTERING THEORY

Differential and total cross section - Scattering amplitude - Scattering amplitude in terms of Green's functions - The Born approximation - Validity of Born approximation - Eikonal approximation- Partial wave analysis: Asymptotic behaviour of partial waves - Scattering amplitude in terms of phase shifts - Optical theorem - Scattering by a square well potential-Scattering by coluomb potential -Scattering by a hard sphere

UNIT – V **18 hrs**

RELATIVISTIC QUANTUM MECHANICS

Generalization of the Schrodinger equation-Hydrogen like atom- The Klein - Gordan equation - the Dirac Equation - Dirac's matrices - Negative energy states - Spin of the Dirac particle - The spin of the Dirac's particle - Spin Orbit Energy -The hydrogen atom

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	P. M. Mathews and K. Venkatesan	A Text Book of Quantum Mechanics	Tata McGraw Hill, New Delhi	1987	Second edition
2.	G. Aruldhas	Quantum Mechanics	Prentice Hall of India	2009	Second edition
3.	A.Ghatak & S. Lokanathan	A Text Book of Quantum Mechanics	Tata McGraw Hill, New Delhi	1987	-
4.	Eugen Merzbacher	Quantum Mechanics	John Wiley & Son,Inc,Newyork	1998	Third edition

Reference Books

S. No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	V. Devanathan	Quantum Mechanics	Narosa Publishing House, New Delhi	2006	-
2.	L. Schiff	Quantum Mechanics	Tata McGraw Hill, New Delhi	2014	Fourth edition
3.	R. Shankar	Principles of Quantum Mechanics	Springer, New Delhi	2007	Second edition
4.	V.K. Thankappan	Quantum Mechanics	Wiley Eastern Ltd, New Delhi	-	Second Edition

Pedagogy

Chalk and talk , Lecture, Seminar, Assignment, power point presentation

Course Designer

Dr.R.MEENAKSHI

Semester -II	Internal Marks : 40	External Marks : 60				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2CC2P	**CORE PRACTICAL II PHYSICS PRACTICALS – II (MICROPROCESSOR AND C++ PROGRAMMING)**	**CP-II**	**-**	**-**	**8**	**4**

Objectives

- To develop programming skills of microprocessor and C++ programming
- To solve some mathematical problems and their applications

Course Outcomes

After successive completion of the course student will be able to

CO Number	CO Statement	Knowledge level
CO 1	Understand the basic operations of 8085 and 8051.	K2
CO 2	Impart the knowledge about the code conversions of 8085.	K2
CO 3	Formulate skills in C++ Programming.	K5
CO 4	Develop skills in decimal counting of 8085	K6

Mapping with programme outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	L	M
CO2	S	M	S	M	M
CO3	S	L	S	M	S
CO4	M	M	S	S	S

S – Strong; M – Medium; L - Low

LIST OF EXPERIMENTS

A. Microprocessor (8085)

1. Finding the largest and smallest numbers in a data array
2. Arranging a set of numbers in ascending and descending orders
3. Study of multi byte decimal addition
4. Study of multi byte decimal subtraction
5. Study of seven segment display
6. Study of ADC interfacing (ADC 0809)
7. Traffic control system
8. Digital clock
9. Generation of square and sine waves using DAC 0800

B. C++ Programming

1. Least-squares curve fitting – Straight-line fit
2. Least-squares curve fitting – Exponential fit
3. Real roots of one-dimensional nonlinear equations - Newton Raphson method
4. Numerical integration – Composite trapezoidal rule
5. Numerical integration – Composite Simpson's 1/3 rule
6. Solution of a second-order ODE – Euler method

Text books

S.NO	Author Name	Year of Publication	Title of the book	Publisher Name
1	C.C. Ouseph, U.J. Rao, V.Vijayendran	May 30, 2009	Practical Physics and Electronics	S.Viswanathan, Printers & Publishers Pvt Ltd
2	Dr.S.Somasundaram	2012	Practical Physics	Apsara Publications
3	Department of Physics, St.Joseph's College.		Practical Physics, (M.sc)	

Pedagogy

Demonstration and Practical sessions

Course Designer

Dr S.GOWRI

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2EC1A	**MICROPROCESSOR AND MICROCONTROLLER**	**EC-I**	**75**	**5**	**-**	**5**

Objectives

- To understand the architecture of 8085 & 8051
- To impart the knowledge about the instruction set

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the architecture of 8085,8051 and impart the knowledge about the instruction set	K2
CO 2	Demonstrate programming proficiency using the various addressing modes and data transfer instructions of microprocessor/Microcontroller	K2
CO 3	Distinguish the instruction set of microprocessor and microcontroller	K4
CO 4	Create program with microprocessor interfaces	K5
CO 5	Develop skill in simple program writing for 8051 & 8085 applications	K6

Mapping with programme outcomes

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

S – Strong; M – Medium; L - Low

Syllabus

UNIT -I: ARCHITECTURE OF 8085 **15 hrs**

Architecture of 8085 - Data and Address buses - Registers in 8085- Addressing modes in 8085- Pin configuration of 8085 - Instruction set of 8085-Instruction types (based on number of bytes, operation) data transfer - Arithmetic - Logical- Branching- Stack and I/O instructions - Instruction cycles - Fetch operation - Execute operation - Machine cycle and State - Instruction and data flow - Timing diagram - Memory read and memory write cycles.

UNIT-II: MICROPROCESSOR PROGRAMING **15 hrs**

Assembly language - Stacks - Subroutines - MACRO - Delay Subroutine - Examples of Assembly language Programming - Addition-Subtraction - complement - shift - mask- find the largest and smallest number in a data array - sum of a series - Multiplication - Division -Multi-byte addition and subtraction.

UNIT - III: DATA TRANSFER SCHEMES AND APPLICATIONS **15 hrs**

Programmed data transfer scheme-Synchronous and Asynchronous and serial data transfer schemes-Interfacing devices- Types of interfacing devices- Programmable Peripheral Interface (PPI- 8255)- Communication interfacing device (Universal Synchronous Asynchronous Receiver Transmitter (USART- 8251))- Programmable Direct Memory Access(DMA) controller (8257).

UNIT - IV: MICROCONTROLLER – 8051 **15 hrs**

Features of 8051 - Architecture - Pin configuration - Memory organization - External data and program memory - Counters and timers - Serial data input/output - Interrupt structure -External interrupts - Addressing modes - Comparison between microprocessor and microcontroller.

UNIT - V: 8051 INSTRUCTION SET AND PROGRAMMING **15 hrs**

Instruction set - Data transfer, arithmetic and logical instructions - Boolean variable manipulation instructions - Program and machine control instructions - Simple programs - Addition and subtraction of two 8-bit and 16-bit numbers - Division - Multiplication - Largest number in a set -Sum of a set of numbers.

Text books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1	B.Ram	Fundamental of Microprocessor ad microcontroller	Dhanpat Rai Publications(P) Ltd, New Delhi	2013	8th Edition
2	A.P. Godse and D.A. Godse.	Microprocessors and Microcontrollers	Technical Publications,Pune	2017	4th Revised Edition

Reference books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1	Muhammad Ali Mazidi, Jinice Gillispie Mazidi	The 8051 microcontroller and embedded systems	Pearson Education, Delhi	2004	2nd Edition
2	A.Nagoorkani	Microprocessors & Microcontrollers	RBA Publications, Chennai	2012	2nd Edition

Pedagogy

Lecture, Seminar, Interaction, OHP and power point presentation, Assignment, Debate

Course Designer

MS.T.NOORUNNISHA

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2EC1B	**NON-DESTRUCTIVE EVALUATION TECHNIQUES**	**EC-I**	**75**	**5**	**-**	**5**

Objectives

- To impart the knowledge in various Non-destructive testing (NDT) techniques.
- To overview the concepts and methods employed for NDT of Structures and materials.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic working principles of various NDT methods and importance of NDT.	K2
CO 2	Demonstrate the limitations of NDT techniques and codes.	K2
CO 3	Compare Non-destructive testing and Mechanical testing.	K4
CO 4	Outline Real time Radiography Techniques.	K4
CO 5	Test the instrumentation techniques with the aid of basic Principles.	K5

Mapping with programme outcomes

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

S – Strong; M – Medium; L - Low

Syllabus

UNIT - I: OVERVIEW OF NDT **15 hrs**

Overview of NDT - NDT Versus Mechanical testing - Overview of the Non-Destructive Testing Methods for the detection of manufacturing defects- Merits and limitations -Visual inspection - Unaided and aided - Visual Examination- Optical aids used for visual inspection- Applications.

UNIT - II: SURFACE NDE METHODS **15 hrs**

Liquid Penetrant Testing- Basic principles – Procedure for penetrant testing - Penetrant testing materials - Testing methods - Applications and limitations - Magnetic Particle Testing Principle- Magnetizing techniques- Procedure-Equipment used for MPT- Limitations-Eddy Current Testing principles- Applications – Limitations.

UNIT - III: RADIOGRAPHY **15 hrs**

Radiography Basic principle - X ray source - production of X rays – High energy X ray source - Properties of X rays and gamma rays- radiographic imaging -Inspection techniques - Applications - Limitations - Safety in radiography.

UNIT - IV: ULTRASONIC TESTING **15 hrs**

Ultrasonic Testing - Basic properties of sound beam- Ultrasonic transducers-Inspection methods- Techniques for normal beam inspection - Techniques for angle beam inspection - Flaw characterization techniques - detection equipment - Modes of display- Immersion testing- Applications - Advantages-Limitations.

UNIT - V: ACOUSTIC EMISSION **15 hrs**

Acoustic Emission - Testing Principles of Acoustic Emission Testing -Techniques- Applications – Thermography: Contact and non contact inspection methods – Heat sensitive paints and other coatings – Heat sensitive papers – Advantages and limitations – Instrumentations and methods – Applications.

Text books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1	Dr.BaldevRaj, T.Jayakumar and M.Thavasimuthu.	Practical Non-Destructive Testing.	Narosa Publications, New Delhi.	2008 (Reprint 2018)	3rd Edition
2	Ravi Prakash.	Non-Destructive Testing Techniques.	New Age International Publishers.	2010	1st Revised Edition

Reference books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1	Barry Hull & Vernun John.	Non Destructive testing	Springer	1988	-
2	Hull B	Non-destructive Testing	Springer Verlag	2012	1st Edition
3	Charles,J. Hellier.	Handbook of Nondestructive evaluation	McGraw Hill, New York	2013	2nd Edition
4	Aquil Ahmad Leonard J. Bond	Non Destructive Examination and Quality Control, Metals Handbook	American Metals Society,Metals Park,OH	1989	Vol.17 9th Edition

Pedagogy

Lecture, Seminar, Interaction, OHP and power point presentation, Assignment, Debate

Course Designer

MS.T.NOORUNNISHA

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2EC2A	**NUMERICAL METHODS AND C++ PROGRAMMING**	**EC – II**	**75**	**5**	**-**	**5**

Objectives

- To provide the knowledge of basic concepts of a numerical methods.
- To enrich the knowledge to apply these problems in C++.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the numerical concepts to find solutions and Eigen values of polynomial equations.	K3
CO2	Solve numerical problems of interpolation and determine the intermediate values of given data	K3
CO3	Compare the various methods of integration and differentiation value with numerical concepts	K4
CO4	Choose the boundary value problems for differential equation	K5
CO5	Compile the numerical concepts in C++ language.	K6

Mapping with programme outcomes

S-Strong; **M**-Medium; **L**-Low

COs	PO1	PO2	PO3	PO4
CO1	L	S	M	S
CO2	L	S	M	S
CO3	L	S	M	S
CO4	L	S	M	S
CO5	L	S	M	S

Syllabus

UNIT-I: SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 15 hrs

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method - Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

UNIT-II: INTERPOLATION AND APPROXIMATION 15 hrs

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae

UNIT-III: NUMERICAL DIFFERENTIATION AND INTEGRATION 15 hrs

Approximation of derivatives using interpolation polynomials- Numerical integration using Trapezoidal, Simpson's1/3 rule - Errors in the Formula -Romberg's method – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules. Two point – four point formulae for first-order derivative – Three point – five point formulae for second-order derivative.

UNIT-IV: INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 15 hrs

Single Step methods - Taylor's series method – First order differential equation: Euler's method - Modified Euler's method – Improved Euler's method – Local and Global truncation error -. Second Order Differential equation: Fourth order Runge-Kutta method and Euler's method.

UNIT-V: PROGRAMMING IN C++ 15 hrs

Constants and variables - I/O operators and statements - Header files - Main function – Conditional statements - Switch statement - Void function - Function program – For, While and do-While Statements – Break-Continue and go to Statement - Arrays.

Text Books

S.No.	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	M.K.Venkataraman	Numerical Methods in Science and Engineering	The National Publishing Company - Madras	1999	5th Edition
2	J.H. Mathews	Numerical Methods for Mathematics, Science and Engineering	Prentice-Hall of India, New Delhi,	1998	2nd Edition
3	E. Balagurusamy	Objected Oriented Programming in C++	McGraw Hill, New Delhi	2013	7th Edition
4	J. R. Hubbard,	Programming with C++	McGraw-Hill New Delhi,	2006	Revised Edition

Reference Books

S.No.	Authors	Title of the book	Publishers	Year of Publication	Edition
1	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computation	New Age International, New Delhi	1993	Revised Edition
2	Bjarne Stroustrup	The C++ Programming Language	Addison-Wesley Pearson Education	2011	4th Edition

Pedagogy

Lecture with Discussion, Power point presentation, Group discussion and Seminars.

Course Designer

Ms.S.PRIYA

Semester -II	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH2EC2B	**BIOMECHANICS AND BIOPHYSICS**	**EC- II**	**75**	**5**	**-**	**5**

Objectives

- To provide the knowledge of basic concepts in bio physics
- To enrich the knowledge to apply the bio physics in Biological systems

Course Outcomes

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

CO Number	CO statement	Knowledge level
CO1	Apply the basic principles of physics to understand the biological systems	K3
CO2	Outline the concepts of Biophysics and Neurophysics	K2
CO3	Evaluate the specimens using Electron Microscopy and NMR Spectroscopy	K5
CO4	Explain the concepts of energy pathways	K5

Mapping with programme outcomes

COs	PO1	PO2	PO3	PO4
CO1	L	S	S	M
CO2	L	S	S	M
CO3	L	S	S	S
CO4	L	S	S	M

S-Strong; **M**-Medium; **L**-Low

Syllabus

UNIT-I : BASIC PHYSICS AND BIO-MECHANICS 15 hrs

Molecular interaction – Steriochemistry – Thermodynamics – Radio Activity – Basic Quantum Mechanics - Striated Muscles – Mechanical properties of Muscles – mechanics of Cardio Vascular systems

UNIT-II : NEUROPHYSICS AND ENERGY PATHWAYS 15hrs

Membrane potential – Voltage Clamp – Neurophysics of vision – Physics of Hearing – Signal Transduction - Thermodynamics in a cell – Energy Conversion – Photo synthesis .

UNIT-III: ELECTRON MICROSCOPE AND NMR SPECTROSCOPY 15 hrs

Electron Optics – TEM – SEM – AFM and their physical principles – Specimen preparation - NMR parameters –Spin-spin coupling - NMR applications to Chemistry and Biochemistry.

UNIT-IV: BIOMECHANICS AS TRANSDUCER AND SENSORS IN BONES AND TISSUE 15 hrs

Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fiber optic temperature sensors.

UNIT-V: BIOMEDICAL MEASUREMENTS IN CARDIAC DIAGNOSTIC AND BLOOD ANALYZERS 15 hrs

Measurement of blood pressure - Cardiac output DIAGNOSTIC- Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analyzers, pH of blood –measurement of blood pCO_2, pO_2, finger-tip oxymeter - ESR, GSR measurements.

Text Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	Vasantha Pattabhi N.Gogtham	Bio Physics	Narosa Publishing House	2002	Revised Edition
2.	P.K. Srivastava	Elementary Bio Physics	Alpha Science International	2005	Revised Edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	Philit Nelson	Bio Physics	W.H. Freeman	2003	Revised Edition

Pedagogy

Lecture, Lecture with discussion and Technical quiz

Course Designer

MS. S. PRIYA

Semester -III	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH3CC7	**STATISTICAL MECHANICS**	**CC -VII**	**90**	**6**	**-**	**5**

Objectives

- To understand the fundamental concepts of thermodynamics
- To impart the significance of classical statistical mechanics
- To gain the basic knowledge of phase transition and partition function

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the concept of thermodynamics	K2
CO2	Evaluate the mean free path	K4
CO3	Explain the classical statistics	K3
CO4	Discuss the quantum statistics	K2
CO5	Distinguish phase transitions	K5

Mapping with program outcomes

COs /Pos	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	M	M	S	S
CO3	S	S	S	M	M
CO4	S	S	M	S	S
CO5	S	S	S	M	M

S – Strong, M – Medium, L – Low

Syllabus

UNIT - I: Thermodynamic laws and applications **18hrs**

Zeroth law – Equation of state of an ideal gas - van der Waals equation of state –Adiabatic equation of a perfect gas - First and second thermodynamical laws - Entropy – Entropy of a perfect gas - Thermodynamic function and Maxwell relations – Clausius- Clayperon equation- Third thermodynamical law – Osmotic pressure –Limit of thermodynamics.

UNIT – II: Kinetic Theory **18hrs**

Binary collisions -Boltzmann transport equation and its validity - Boltzmann's H-theorem - Relation between H-function and entropy - Maxwell--Boltzmann distribution of velocities - Mean free path – Conservation laws – Zero order approximation - First order approximation- Transport phenomena -- Thermal conductivity -- Diffusion process –Viscosity-Brownian motion

UNIT –III: Classical Statistical Mechanics **18hrs**

Basic postulates of classical statistical mechanics – Phase space -Microcanonical Ensemble- Ideal gases in Microcanonical Ensemble (Sackur –Tetrode formula) - Entropy of a perfect gas in Microcanonical Ensemble - Equipartition theorem – Classical ideal gas – Gibb's paradox - Canonical Ensemble – Energy fluctuations in canonical ensemble - Grand canonical ensemble - Density fluctuations in grand canonical ensemble - Comparison of ensembles.

UNIT – IV: Quantum Statistical Mechanics **18hrs**

Basic postulates of quantum statistical mechanics – Microcanonical ensemble –Canonical ensemble – Grand canonical ensemble - Bose – Einstein and Fermi Dirac grand partition functions - Bose – Einstein distribution - Fermi Dirac distribution-Maxwell Boltzmann distribution - Bose -Einstein gas – Fermi gas - Bose – Einstein condensation

UNIT -V: Phase transition **18hrs**

Introduction – Phase transition – Condition for Phase transition – First and second order phase transitions –Critical exponents – Ising model of phase transition -Bragg Williams's approximation- one dimensional Ising model

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	Satyaprakash	Statistical Mechanics	Kedarnath and Ramnath Publishers	2003	Revised edition
2.	A.K.Saxena	Introduction to thermodynamic and statistical Mechanics	Narosa Publishers	2016	Revised edition
3.	Kerson Kuang	Statistical Mechanics	Narosa Publishers	1963	Second edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	Gupta S. L & Kumar V	Statistical Mechanics	Pragati Prakashan, Meerut	-	24 th edition
2.	S.K. Sinha	Introduction to statistical Mechanics	Narosa, New Delhi	2007	Revised edition
3.	F. Reif	Fundamentals of Statistical and Thermal Physics	McGraw Hill, Singapore	1985	Revised edition

Pedagogy

Chalk and talk Power point presentation, Group discussion and Seminars

Course Designer

Dr R. MEENAKSHI

Semester -III	Internal Marks : 25	External Marks : 75				
Course code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH3CC8	**SOLID STATE PHYSICS**	**CC – VIII**	**75**	**6**	**-**	**5**

Objectives

- To understand the basic structure of crystals by crystal diffraction method
- To acquire the knowledge about dielectric and ferroelectric crystals
- To gain the basic idea on superconductors and its applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the fundamental principles and crystal structure of the solid materials	K2
CO2	Identify the mode of vibrations in the atoms	K3
CO3	List the materials behavior of the electric properties and category the ferroelectric crystals	K4
CO4	Explain the magnetic properties and its applications	K5
CO5	Develop the basic concepts of superconductors materials	K6

Mapping with Programme Outcome

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

S – Strong, M – Medium, L – Low

Syllabus

UNIT - I: Crystal structure **15 hrs**

Bravais lattice - simple - body centered and face centered - cubic lattices primitive cell - Wigner Seitz cell - crystal structures and lattice with basis hexagonal close packed - diamond structure - point groups - space groups - Miller indices - reciprocal lattice - atomic scattering factor -structure factor –Bragg's law of XRD – XRD technique - Laue - powder and rotating crystal methods.

UNIT - II: Lattice Vibrations and Thermal Properties **15 hrs**

Bloch theorem - Kronig - Penney model - vibrational modes of one dimensional line of atoms-linear diatomic lattice - acoustic and optical modes - quantization of lattice vibrations - phonon momentum - inelastic scattering of neutrons - classical theory of lattice heat capacity - Einstein and Debye theories - lattice thermal conductivity - phonon mean free path - origin of thermal expansion and Gruneisen relation.

UNIT - III: Dielectrics and Ferroelectrics **11 hrs**

Macroscopic description of the static dielectric constant - total polarization- measurement of dielectric constant of a solid - Clausius-Mosotti relation - classification of ferroelectric crystals - Landau theory of the phase transition – antiferroelectricity – ferroelectric domains.

UNIT - VI: Magnetic Properties **14 hrs**

Types of magnetism - Langevin's theory of diamagnetism and paramagnetism - quantum theory of paramagnetism - origin of permanent magnetic moment - Weiss theory of ferromagnetism - the Bloch wall - ferromagnetic domains and hysteresis - ferrimagnetism.

UNIT - V: Superconductivity **20 hrs**

Occurrence of superconductivity - properties of superconductors- effect of magnetic field - Meissner effect - Type I and type II superconductors - isotope effect - entropy - heat capacity and thermal conductivity. Energy gap - microwave and infrared absorption - theoretical explanations: London's equations - penetration depth - coherence length, Cooper pairs - BCS theory - AC and DC Josephson effects - high temperature superconductors (basic concepts) - SQUID.

Text Book

S.No	Authors	Title of the Book	Publishers	Year of publication	Edition
1.	A. J. Deckker	Solid State Physics	Macmillan, India	2000	1st edition
2.	C. Kittel	Introduction to Solid State Physics	Wiley	2004	8th edition
3.	R. L. Singhal	Solid State Physics	Kedar Nath Ram Nath	2003	7 revised
4.	Gupta Kumar	Solid State Physics	K Nath & Co	2013	9th edition
5.	S. O. Pillai	Solid State Physics	New Age International	2006	Revised

Books for reference

S.No.	Author name	Title of the Book	Publishers	Year of publication	Edition
1.	M. Ali Omar	Elementry Solid State Physics	Addison – Wesley	1975	2th edition
2.	L. V. Azoroff	Introduction to Solids	TMH Pub.	1993	1th edition
3.	N. W. Ashroft and N. D. Mermin Holt	Solid State Physics	Cengage Learning	1987	1th edition

Pedagogy

Chalk and talk, power point presentation, assignment, seminar, interaction, problem solving

Course Designer:

Ms.K.ASWANIYA

Semester -III		External Marks : 100				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH3CC9	**Physics for competitive Examination**	**CC-IX**	**75**	**5**	**-**	**5**

Objectives

- To understand the fundamental concepts of physical sciences
- To gain the knowledge of error analysis and experimental methods
- To impart the concepts of the atomic & molecular physics

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the digital techniques and applications	K2
CO2	Evaluate the error analysis	K4
CO3	Explain the measurement methods	K3
CO4	Discuss the atomic & molecular physics	K2
CO5	Distinguish the dfifferent spectroscopies	K5

Mapping with program outcomes

COs /Pos	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**M**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**M**	**M**
CO4	**S**	**S**	**M**	**S**	**S**
CO5	**S**	**S**	**S**	**M**	**M**

S – Strong, M – Medium, L – Low

Syllabus

UNIT - I: Electronics **14hrs**

Digital techniques and applications – Impedance matching – amplification and noise reduction – Lock in detector –Box- Car integrator – Modulation techniques

UNIT – II: Error analysis **13hrs**

Data interpretation and analysis – Least square fitting – Working procedure – Error analysis

COMBINATION OF ERRORS

UNIT –III: Measurement methods **13hrs**

Linear curve fitting – Non linear curve fitting - chi square fitting – Transducers and its type - Particle detectors – Measurement systems

UNIT – IV: **15hrs**

Atomic Physics

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects.

UNIT -V: **20hrs**

Infrared & Raman Spectroscopy

Vibrating diatomic molecule - Diatomic vibrating rotator - Linear and symmetric top molecules FT techniques- Pure rotational Raman spectra - Linear molecules - Symmetric top molecules - Vibration Raman spectra - Surface enhanced Raman spectroscopy.

NMR:

Basic principles - Shielding and deshielding effects -Chemical shift - Spin lattice and spin-spin relaxation - Coupling constants

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication	Edition
1.	W. Malemnganba Chenglei	UGC-CSIR NET (JRF & LS) Physical Science	Arihant	2016	Third edition
2.	Surekha Tomar	CSIR-UGC NET/JRF/SET Physical Sciences-	Upkar Prakashan		
3.	S.N. Ghosal	Atomic Physics	S.Chand	2007	Revised Edition
4.	C.N. Banwell	Fundamentals of Molecular Spectroscopy	McGraw Hill	1981	4thEdition
5.	G. Aruldhas	Molecular Structure and Spectroscopy	Prentice Hall	2006	2ndEdition
6.	D.N. Sathyanarayana	Vibrational Spectroscopy	New Age Inter-national	2015	3rd Edition

Reference Books

S.No	Author	Title of the book	Publishers	Year of publication	Edition
1.	R. Nageshwara Rao	CSIR-UGC NET/SET (JRF & LS) PHYSICAL SCIENCES	Khanna Publishers	2019	-
2.	G. Aruldhas	Molecular Structure and Spectroscopy	rentice Hall	2006	2ndEdition
3.	D.N. Sathyanarayana	Vibrational Spectroscopy	New Age Inter-national	2015	3rd Edition

Pedagogy

Chalk and talk Power point presentation, Group discussion and Seminars

Course Designer

1.Dr R. MEENAKSHI 2. Ms A.MARY GIRIJA

Semester -III	Internal Marks : 40	External Marks : 60				
Course Code	**Course Title**	**CATEGORY**	**L**	**T**	**P**	**CREDIT**
19PPH3CC3P	**CORE PRACTICAL III PHYSICS PRACTICALS – III (GENERAL AND ELECTRONICS)**	**CP-III**	**-**	**-**	**8**	**4**

Objectives

- To acquire knowledge about the experimental verification of certain physical constants and properties.
- To verify the characteristics of semiconductor materials
- To gain the applications of electronic devices.

Course Outcome

After successive completion of the course student will be able to,

CO Number	CO Statement	Knowledge level
CO 1	Study the electrical and magnetic behaviour of Semiconductor materials.	K2
CO 2	Learn about the potential of optics applications in different areas of research and development.	K4
CO 3	Analyse and apply the characteristics of memory units and electrical circuit.	K4
CO 4	Apply the concepts of operational amplifier to design differential amplifier.	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	M	M
CO3	S	M	S	M	S
CO4	M	M	S	S	S

S – Strong; M – Medium; L - Low

LIST OF EXPERIMENTS

GENERAL

1. Determination of q,n,σ by hyperbolic fringes.
2. Determination of L by Anderson method.
3. Polarizabilities of liquids by finding the refractive indices at different wavelength.
4. Magnetic susceptibility by Quincke's method.
5. Determination of specific rotatory power of liquid using Polarimeter.
6. Four probe method-determination band gap energy of a semiconductor.

ELECTRONICS

1. Study of ALU.
2. Voltage Controlled Oscillator Using IC 555.
3. Four bit binary Up and Down Counter using IC7476.
4. Differential amplifier using OP-Amp.
5. Simplification of Boolean expression by Karnaugh map.
6. Frequency response of RC coupled amplifier.

Text books

S.NO	Author Name	Year of Publication	Title of the book	Publisher Name
1	C.C. Ouseph, U.J. Rao, V.Vijayendran	May 30, 2009	Practical Physics and Electronics	S.Viswanathan, Printers & Publishers Pvt Ltd
2	Dr.S.Somasundaram	2012	Practical Physics	Apsara Publications
3	Department of Physics, St.Joseph's College.		Practical Physics,(M.sc)	

Pedagogy

Demonstration and Practical sessions

Course Designer

Ms.D.DEVI.

Semester -III	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH3EC3A	**CRYSTAL GROWTH AND THIN FILM PHYSICS**	**EC-III**	**75**	**5**	**-**	**5**

Objectives

- To understand the nucleation phenomena
- To develop the knowledge of experimental methods of crystal growth techniques
- To gain the growth aspects of thin film ideas.

Course Outcome

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

CO Number	CO statement	Knowledge level
CO1	Outline the basic knowledge of growth phenomena and discuss the theoretical aspects of nucleation.	K2
CO2	Apply the experimental ideas of low temperature solution growth mechanism.	K3
CO3	Analyze the concepts on vapour growth techniques	K4
CO4	Explain the process of thin films sample preparation method.	K5
CO5	Formulate the latest developments in characterization techniques and analyze the usage of materials.	K6

Mapping with Program Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

UNIT- I:Crystal growth Phenomena **20 hrs**

Fundamentals of Crystal Growth Importance of crystal growth – Classification of crystal growth methods – Basic steps: Generation, transport and adsorption of growth reactants – Nucleation: Theories of nucleation –Classical theory of nucleation: Gibbs Thomson equations for vapour and solution – Kinetic theory of nucleation – Becker and Doring concept on nucleation rate – Energy of formation of a spherical nucleus – Statistical theory on nucleation: Equilibrium concentration of critical nuclei, Free energy of formation.

UNIT -II: Low temperature solution growth **10 hrs**

Selection of solvents and solubility – Meir's solubility diagram – Saturation and supersaturation – Metastable zone width – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods– Crystal growth in Gel media: Chemical reaction and solubility reduction methods.

UNIT- III: Vapour Growth Techniques **10 hrs**

Basic principles – Physical Vapour Doposition (PVD): Vapour phase crystallization in a closed system – Gas flow crystallization – Chemical Vapour Deposition (CVD): Advantageous and disadvantageous. : Melt Growth Techniques -Czochralski pulling method – Bridgeman technique

UNIT- IV: **Thin Film structure** **15 hrs**

Preparation of Thin Films Spray pyrolytic process – characteristic feature of the spray pyrolytic process – ion plating – Vacuum evaporation – Evaporation theory – The construction and use of vapour sources – sputtering Methods of sputtering – Reactive sputtering – RF sputtering - DC planar magnetron sputtering

UNIT -V :Characterisaion Techniques **20 hrs**

X-Ray diffraction studies (XRD)- single and powder XRD equipment-Examination of typical XRD pattern. Spectroscopic Techniques: Fourier transform infrared Analysis (FTIR)-Ultraviolet photo electron spectroscopy (UPS), X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES).Electron Imaging Techniques and their Applications: Principle and working of SEM, TEM, AFM and sample preparations.

Text Books:

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	P.Santhanaragavan &P.Ramasamy	Crystal growth process & Methods	KRU Publications, Kumbakonam	2001	1st edition
2.	J.C. Brice	Crystal Growth Processes	John Wiley, New York.	1986	1st edition
3.	B.R. Pamplin,	Crystal Growth	Pergamon Press, Oxford.	1981	2nd Revised edition
4.	A.Goswami	Thin film fundamentals	New Age,New Delhi.	2008	1st edition
5.	Yang Leng	Materials Characterization: Introduction to Microscopic & SpectroscopicMethods	Wiley & Sons, 2013	2013	1st edition

Reference Books

S.No	Author name	Title of the book	Publisher name	Year of Publication	Edition
1.	M.Orhring	Materials Science of Thin films	Academic Press,Boston	2002	2nd edition
2.	Sam Zhang, Lin Li and Ashok Kumar	Materials Characterization Techniques	CRC Press	2008	1st edition

Pedagogy:

Lecture with Power point presentation, Group discussion, Online Assignment

Course Designer:

Dr.S.GOWRI

Semester -III	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH3EC3B	**MATERIAL CHARACTERIZATION AND MEASUREMENT TECHNIQUES**	**EC-III**	**60**	**5**		**5**

Objectives

- To develop the knowledge in Basic concepts and experimental methods of X-ray diffraction
- To know the instrumentation details of image formation techniques and application
- To enrich the knowledge of material characterization and measurement techniques

Course Outcome

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

CO Number	CO statement	Knowledge level
CO1	Illustrate the basic knowledge of optical microscope and image formation	K2
CO2	Demonstration of X-ray diffractometer and its applications.	K3
CO3	Analyze the concept on electron microscope	K4
CO5	Examine the formationof SEM&TEM images	K5
CO4	Discuss the latest developments in measurement techniques and to analyze the usage of materials.	K6

Mapping with Program Outcomes

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

S-Strong**; M**-Medium; **L**-Low

Syllabus

UNIT-1 Scope of optical metallographic studies: 15 hrs

Image formation, resolving power, numerical aperture, empty magnification, depth of focus, components of microscopes, principles of phase contrast, interference and polarized light microscopy, elements of quantitative metallography and image processing.

UNIT-II X Ray diffraction and their applications: 15hrs

X-ray - diffraction directions, diffraction methods. X-ray - diffraction intensities, factors affecting intensity, 'structure factor'. Working principles of diffractometer, counters and cameras. Chemical analysis by X-ray diffraction & fluorescence, determination of particle size and micro/macro strains.

UNIT-III Studies by electron microscopes: 10hrs

Construction and working principles of transmission electron microscopes. Image formation, resolving power, magnification, depth of focus, elementary treatment of image contrasts. Bright field and dark field images.

UNIT-IV Stereographic projection and their applications. 10hrs

Scanning electron microscope; construction, interaction of electrons with matter, modes of operation, image formation of plane and fractured surfaces

UNIT-V Metallographic techniques: 10hrs

Optical metallography, image analysis. X-ray fluoroscopy, spectrometry, DTA, DSC and TGA, working principle, applications. Types and applications of strain gauges.

Text Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	Spencer, Michael	Fundamentals of Light Microscopy	Cambridge University Press	1982	-
2.	Joseph I Goldstein, Dale E Newbury, Patrick Echlin and David C Joy	Scanning Electron Microscopy and X-Ray Microanalysis	e-Text book	2005	3rd Edition
3.	B.D.Cullity and S.R.Stock	Elements of X-Ray Diffraction	Prentice Hall, New Jersey	2001	Third edition,
4.	G.W.H. Hohne,W.F. Hemminger,H. J. Flammersheim	Differential Scanning Calorimetry	Springer, 2nd rev. a. enlarged ed.,	2003	second
5.	P.E.Champness	Electron Diffraction in the Transmission Electron Microscope	Garland Science, USA	2001	-
6.	Smallman R. E.,	Modern Physical Metallurgy', ,	Butterworths	1985	4th Edition
7.	Philips V. A.	Modern Metallographic Techniques and their Applications'	Wiley Interscience,	1971	-

Microscopy Books:

1.www.tedpella.com/books_html/books.htm

2. Electron Microscopy: www.net/biobooks_1_electron- microscopy.html

3. Thermal Analysis Excellence: www.mt.com/ta

Pedagogy

Lecture, online Assignment, Tutorial session in the measurement lab.

Course Designer

Dr. S.GOWRI

Semester - IV	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH4CC10	**NUCLEAR AND PARTICLE PHYSICS**	**CC - X**	**75**	**5**	**-**	**5**

Objectives

- To demonstrate knowledge and understanding of the fundamental concepts of nuclear physics
- To learn the basics of nuclear models and elementary particles

Course Outcomes

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

CO Number	CO statement	Knowledge Level
CO 1	Outline the models of nucleus	K2
CO 2	Explain the properties of elementary particles	K2
CO 3	Analyze the nuclear radioactivity and reactions	K4
CO 4	Estimate the different kind of reactors	K5
CO 5	Determine the classification of elementary particles	K5

Mapping with programme outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	M	M
CO 2	S	M	S	S	S
CO 3	S	S	S	S	M
CO 4	S	M	S	S	S
CO 5	S	S	S	S	S

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

Syllabus

UNIT – I: BASIC PROPERTIES OF NUCLEUS 15 hrs

Nuclear mass and binding energy - atomic masses - systematics of nuclear binding energy - nuclear size - spin and parity - statistics of nucleus – magnetic dipole moment - electric moments - electric quadrupole moments - isospin - nuclear forces - ground state of the deuteron - wave equation for the deuteron and solution - low energy proton neutron scattering - spin dependence of n-p interaction - charge symmetry – charge independence – repulsion at short distances – exchange forces – meson theory.

UNIT – II: NUCLEAR DECAY AND RADIOACTIVITY 20 hrs

Theory of alpha disintegration-Geiger-Nuttal law – Gamow theory- neutrino hypothesis - Fermi theory of beta decay - selection rules -Sargent diagram - orbital electron capture-non conservation of -parity - double beta decay – gamma ray spectra and nuclear energy level - radio active transition in nuclei - Nuclear isomerism - internal conversion - resonance fluorescence - angular correlation.Gamma ray spectroscopy – Mossbauer effect- Interaction of charged particles and X-rays with matter – Types and basic principles of particle detectors.

UNIT – III: NUCLEAR REACTIONS AND NUCLEAR MODELS 20 hrs

Types of nuclear reactions - conservation laws - reaction energetics – Q value - threshold energy- nuclear reaction cross section - level width - compound nuclear theory -Reciprocity theorem – Breit-Wigner formula – Resonance theory – Liquid drop model – Shell model -- Evidences for shell model -- Magic numbers - Harmonic oscillator – Square-well potential -- Spin-orbit interaction – Collective model of a nucleus.

UNIT – IV: FISSION AND FUSION REACTORS 15 hrs

Characteristics of fission – Mass distribution of fragments – Radioactive decay processes – Fission cross-section – Energy in fission – Bohr-Wheeler's theory of nuclear fission – Fission reactors – Thermal reactors – Homogeneous reactors – Heterogeneous reactors – Basic fusion processes -- Characteristics of fusion –Solar fusion – Controlled fusion reactors.

UNIT – V: PARTICLE PHYSICS 5 hrs

Production of new particles in high energy reaction- classification of elementary particle - fundamental interaction - quantum numbers - anti particles - resonances - law in production and decay process.

Textbooks

S. No.	Authors	Title of the book	Publishers	Year of Publication	Edition
1	K. S. Krane	Introductory of Nuclear Physics	John-Wiley, New York.	1987	Revised
2	S. B. Patel	Nuclear Physics: An Introduction	New Age, New Delhi.	2009	Revised
3	D. C. Cheng and G. K. O'Neill	Elementary Particle Physics: An Introduction	Addison-Wesley, New York.	1979	Revised
4	D.C. Tayal	Nuclear Physics	Himalaya House, New Delhi	2011	Revised
5	S.L. Kakani and S. Kakani	Nuclear and Particle Physics	Anshan Publication, New Delhi.	2009	Revised

Reference books

S. No.	Authors	Title of the book	Publishers	Year of Publication	Edition
1	R.C. Sharma	Nuclear Physics	K. Nath and Co, Meerut.	2004	Revised
2	B. L. Cohen	Concepts of Nuclear Physics	Tata McGraw Hill, New Delhi.	1988	Revised

Pedagogy

Lecture, Seminar, Assignment, Power Point Presentation

Course Designer

1. Dr. V. CHITHIKA RUBY 2. Dr. M. KAVIMANI

Semester - IV	Internal Marks : 40	External Marks : 60				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH4CC4P	**CORE PRACTICAL IV PHYSICS PRACTICALS -IV (ELECTRONICS)**	**CP-IV**	**-**	**-**	**120**	**4**

Objectives

- To understand the different types electronic devices.
- To acquire knowledge about combinational logic circuits.

Course Outcome

After successive completion of the course student will be able to,

CO Number	CO Statement	Knowledge level
CO 1	Acquire basic knowledge of digital logic levels and its application.	K2
CO 2	Analyse and construct combinational logic circuits	K4
CO 3	Demonstrate practical skills in functioning and testing the digital system.	K5
CO 4	Take projects in electronics relevant to industrials.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	M	M
CO3	S	M	S	M	S
CO4	M	M	S	S	S

S – Strong; **M** – Medium; L - Low

LIST OF EXPERIMENTS

1. Verification of Demorgan's theorems and Boolean expressions.
2. FET amplifier (CD and CS Configuration)
3. Phase Shift Oscillator using IC 741.
4. Digital to Analog converter (R-2R and Weighted method)
5. Study the function of Multiplexer and Demultiplexer
6. Study the function of Encoder and Decoder.
7. Study the function of Flip Flops.
8. Half Adder and Full Adder using only NAND& NOR Gates.
9. Half Subtractor and Full Subtractor using only NAND& NOR Gates.
10. BCD to Seven segment display.
11. Characteristics of LED and Photodiode.
12. Design and study of Schmitt trigger using IC 555.

Text books

S.NO	Author Name	Year of Publication	Title of the book	Publisher Name
1	C.C. Ouseph, U.J. Rao, V.Vijayendran	May 30, 2009	Practical Physics and Electronics	S.Viswanathan, Printers & Publishers Pvt Ltd
2	Dr.S.Somasundaram	2012	Practical Physics	Apsara Publications
3	Department of Physics, St.Joseph's College.		Practical Physics,(M.sc)	

Pedagogy

Demonstration and Practical sessions

Course Designer

Ms.**D.DEVI**

Semester - IV	Internal Marks : 25	External Marks : 75				
COURSE CODE	**Course Title**	**CATEGORY**	**L**	**T**	**P**	**CREDIT**
19PPH4EC4A	**NONLINEAR OPTICS**	**EC-IV**	**75**	**5**	**-**	**4**

Objectives

- To develop the underlying concepts from the perspectives of classical electrodynamics and advanced quantum mechanics.
- To understand nonlinear phenomena from the fundamental perspective of quantum mechanics.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain sources and propagation of optical electromagnetic waves.	K2
CO2	Illustrate nonlinear phenomena from the fundamental perspective of quantum mechanics.	K2
CO3	Develop a detailed physical and mathematical understanding of a variety of systems and processes in a range of advanced topics in physics	K3
CO4	Analyze basic concepts and applications effectively.	K4
CO5	Appraise the ability to perform research and development projects using advanced theoretical and experimental skills and tools.	K5

Mapping with Programme Outcomes

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

S – Strong; M – Medium; L – Low

Syllabus

UNIT -I: The Nonlinear Optical Susceptibility **15 hrs**

Introduction to Nonlinear Optics – Description of Nonlinear Optical Processes –Second-Harmonic Generation – Sum- and difference- frequency generation – Sum- frequency generation – Difference- frequency generation – Optical parametric oscillation – Third-order nonlinear optical processes – Third-Harmonic generation – Intensity dependent Refractive Index

UNIT -II: Wave-Equation Description of Nonlinear Optical Interactions **15 hrs**

The wave equation for nonlinear optical media – The coupled-wave equation for Sum-Frequency generation – phase matching – Quasi-phase-matching – The Manley-Rowe relations – Sum-Frequency generation.

UNIT-III: Second-Order Optical Nonlinearities **15 hrs**

Second-harmonic generation –difference-frequency generation and parametric amplification – Optical parametric oscillators – Nonlinear optical interactions with focused Gaussian beams – Nonlinear optics at an Interface

UNIT- IV: Third-Order Optical Nonlinearities **15 hrs**

Third harmonic generation –Optical Kerr effect - Self Phase modulation – Self focusing – Spatial solitons – Raman Gain – Four wave mixing – Degenerate four-wave mixing as a form of Real-time holography – Use of phase conjugators in wave restoration

UNIT- V: Applications **15 hrs**

Optical Solitons – Differential equation for the wave envelope – Solitons – Soliton lasers – Optical Phase Conjugation – Optical bistability – Optical switching

Textbooks

S.No.	Author Name	Title of the book	Publisher Name	Year of Publication	Edition
1.	Robert W Boyd	Nonlinear Optics	Academic Press	2015	3rd
2.	N. Bloembergen	Nonlinear Optics	World Scientific Pub Co Inc	1996	4th

Reference books

S.No.	Author Name	Title of the book	Publisher Name	Year of Publication	Edition
1.	Shanmuganathan Rajasekar, Juan C Vallejo	Nonlinear Resonances	Springer International Publishing	2016	1st
2.	Y Guo, C K Kao, E.H.Li, K. S.Chiang	Nonlinear Photonics	Springer	2002	1st
3.	Y R Shen	Principles of Nonlinear Optics	Wiley-Interscience	2002	1st
4.	H S Nalwa and S Miyata	Nonlinear Optics of Organic Molecules and Polymers	CRC Press	1997	1st
5.	RA Fischer	Optical Phase Conjugation	Academic Press	1983	1st

Pedagogy

Chalk and talk, Assignment, power point presentation, Group discussion, Seminar

Course Designers:

1. **Ms.D.DEVI**
2. **Ms.N.MANOPRADHA**

Semester - IV	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH4EC4B	**SPACE PHYSICS**	**EC-IV**	**75**	**5**	**-**	**5**

Objectives

- To develop the underlying concepts of solar system and planetary atmospheres.
- To understand quantitative behaviour of different space physics phenomena using various analysis method

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain principal environments of the solar system.	K2
CO2	Illustrate the physical theories that control the qualitative properties of different space plasma phenomena.	K2
CO3	Develop an understanding of how space physics has a practical impact on everyday life in the field of space weather.	K3
CO4	Calculate the quantitative behaviour of different space physics phenomena using various analysis method.	K4
CO5	Identify ways in which experimental studies of space physics phenomena have advanced our understanding of basic plasma physics in the field of research.	K5

Mapping with Programme Outcomes

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

S – Strong; M – Medium; L – Low

Syllabus

UNIT-I: Sun and Planetary System **15 hrs**

Solar atmosphere-Solar corona-Solar Electromagnetic radiation-Solar cycles and solar variability-Solar Energetic particles-Magnetic field energy-Planetary exploration-Characteristics of the planets-Bulk atmospheric composition-Planetary magnetic fields.

UNIT- II: Solar wind interaction with planets **15 hrs**

Equations of Magnetohydrodynamics-Formation of Bow shock-Interaction with magnetized planets-Interaction with non-magnetized planets-Motion of charged particles in electromagnetic field and ring current.

UNIT - III: Plasma Waves **15 hrs**

Plasma waves in planetary magnetospheres-Plasma environment and waves in outer planets-plasma waves at Venus,Mars,Mercury-Wave particle interaction-Magnetohydrodynamics (MHD) waves-Plasma instabilities-Applications of Plasma.

UNIT- IV: Energy deposition by Charged particles **15 hrs**

Colllision cross section-Time dependent perturbation theory- The Born Approximation-Semi-empirical electron impact cross section-Energy deposition techniques-CSDA and Loss function-Analytical yield Spectrum-Charge transfer-Electronic Recombination.

UNIT -V: Planetary atmosphere and cosmic rays **15 hrs**

Hydrostatic Equation-Eddy molecular diffusion-Thermal structure-Radiative transfer-Occultation technique-Atmospheric dynamics-Atmospheric temperature of planets-Cosmic rays-Bethe-Bloch formula-Ionization rate-Cosmic ray ionization in planetary atmosphere.

Textbooks

S.No.	Author Name	Title of the book	Publisher Name	Year of Publication	Edition
1.	R.P.Singhal	Elements of Space Physics	PHI Learning Private Limited	2015	2nd
2.	BaidyanathBasu	An introduction to Astrophysics	PHI Learning Private Limited	2013	2nd

Reference books

S.No	Author Name	Title of the book	Publisher Name	Year of Publication	Edition
1	Margaret G.KivelsonChrostopher T.Russell	Introduction to Space Physics	Cambridge University press	1995	2nd
2	Steven Weinberg	Gravitation and cosmology	Wiley	2008	1st
3	A.K.Raychaudhuri, S.Banerji, A.Banerjee	General Relativity,Astrophysics and Cosmology	Springer	2003	1st

Pedagogy

Chalk and talk, Assignment, power point presentation, Group discussion, Seminar

Course Designers:

1.Ms.D.DEVI

2.Ms.N.MANOPRADHA

Semester - IV	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH4EC5A	**NANO PHYSICS**	EC-V	75	5	-	4

Objectives

- To understand the material physics on the nano scale and the application aspects of nanoscience and technology
- To understand the carbon nanostructures and their properties

Course Outcome

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

CO Number	CO statement	Knowledge level
CO1	Classify the dimensional nanostructure materials	K2
CO2	Identify the carbon nanostructures and their properties	K3
CO3	Analyze the synthesis of nanomaterials	K4
CO4	Explain the characterization techniques used for nanomaterials	K5
CO5	Discuss the applications of nanomaterials	K6

Mapping with Program Outcomes

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

S-Strong; **M**-Medium; **L**-Low

Syllabus

UNIT-I Introduction to Nanomaterials 13hrs

Need and origin of Nano-Nano and energetic-Top-down and bottom-up approaches-Introductory ideas of 1D, 2D and 3D nanostructured materials-Quantum dots -Quantum wire -Quantum well-Exciton confinement in Quantum dots.

UNIT-II Carbon Nanostructures and Properties 14hrs

Carbon molecules-Carbon bond-C_{60}: Discovery and structure of C_{60} and its crystal-Superconductivity in C_{60}-Carbon nanotube-Fabrication-Structure-Electrical Properties-Vibrational properties-Mechanical properties-Applications-Field Emission and Shielding-Fuel Cells-Chemical sensors-Catalysis.

UNIT-III Synthesis of Nanomaterials 18hrs

Physical Method: High energy ball milling- Laser Ablation-Chemical Vapour Deposition (CVD)-Molecular Beam Epitaxy (MBE)-Chemical Methods: Sol-Gel method-Solvothermal synthesis-Hydrothermal Synthesis-Sonochemical Synthesis-Microwave Synthesis-Co-Precipitation.

UNIT-IV Characterization of Nanomaterials 15hrs

Characterization of materials Optical characterization (UV-Vis, Photoluminescence, Raman), phenomena of diffraction radiation, X-ray diffraction, phase identification, Scherrer formula, strain and grain size determination, scanning electron microscope (SEM)-Energy dispersive X-ray analysis (EDX)-Transmission electron microscope (TEM).

UNIT-V Applications 15hrs

Energy-Dye Sensitized Photovoltaic solar cell-Fuel cell-Hydrogen Generation and Storage-Medical Field-Drug Delivery-Cancer Therapy-Tissue repair-Agricultural and Food.

Text Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	M.A. Shah and Tokeer Ahmad	Principles of Nanoscience and Nanotechnology	Narosa	2010	Revised Edition
2.	T. Pradeep	A Textbook of Nanoscience and Nanotechnology	Tata McGraw Hill	2014	10th Reprint
3.	C.P. Poole and F.J.Ownes	Introduction to Nanotechnology	Wiley	2003	Reprint (2014)
4.	Sulbha.K Kulkarni	Nanotechnology: Principles and Practices	Springer	2015	3rd Edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	R.W.Kelsall, I.W. Hamley and M. Geoghegan	Nanoscience and Nanotechnology	John-Wiley	2005	1st Edition

Pedagogy

Lecture, Lecture with discussion, Group Discussion

Course Designer

1. **Dr. B. ANITHA**
2. **Ms. J. AARTHI**

Semester - IV	Internal Marks : 25	External Marks : 75				
Course Code	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**
19PPH4EC5B	**ASTROPHYSICS**	**EC-V**	**75**	**5**	**-**	**4**

Objectives

- To provide the basic concepts of Astrophysics.
- To understand the physics of the formation of White Dwarfs and Neutron stars. Dynamics of Binary stars

Course Outcome

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

CO Number	CO statement	Knowledge level
CO1	Explain the Positional Astronomy: Measurement of distances, and angular positions of celestial objects.	K2
CO2	Identify the Physical Principles involved in stellar processes. Structure and evolution of stars	K3
CO3	Examine the physics of the formation of White Dwarfs and Neutron stars. Dynamics of Binary stars	K4
CO5	Explain the Types of Galaxies, Dynamics of stars in a galaxy and its implication for dark matter.	K5
CO4	Discuss the Expansion of the Universe and evolution of temperature in the Universe. 21 cm Cosmology.	K6

Mapping with Program Outcomes

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

S-Strong**; M**-Medium; **L**-Low

Syllabus

UNIT-I Distance measurements **15hrs**

Historical measurement of the Radius of the Earth Distance to Moon and Sun –Parallax method to measure the distance to nearby stars – Distance to inner planets – Cepheid Variables and distance to nearby Galaxies.

Angular coordinates to describe angular positions on the Celestial Sphere – RA and Declination – Concept of Zenith – Nadir.

UNIT-II Stellar structure 1**5hrs**

Virial Theorem – application of virial theorem to stellar systems – Formation of stars – Hertzsprung Russell Diagram – main sequence – Mass – Luminosity – Temperature relations of stars in Main Sequence – Post main sequence evolution of stars – Star clusters.

UNIT-III Compact Objects **15hrs**

Formation of White dwarf and neutron stars – Mass estimation of relativistic and non-relativistic white dwarf – Chandrasekhar Mass limit – Mass of Neutron stars – Binary stars in a co rotating frame – types of binaries – Lagrange points – Qualitative aspects of mass transfer and accretion disk formation.

UNIT-IV Galaxies **15hrs**

Types of Galaxies – Hubble's tuning fork diagram – dynamics of stars in galaxies – rotation curve in spiral galaxies – velocity distribution of stars in Elliptical Galaxies – the Discovery of Dark Matter – Problems on density profile calculation using different rotation curves.

UNIT-V Basic Cosmology **15hrs**

Newtonian derivation for the expansion of the Universe – Hubble's law –Radiation and matter in Cosmology – evolution of radiation Temperature in the Universe – Basics of Cosmic Microwave Background Radiation – The importance of 21 cm radiation.

Text Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	Frank H. Shu	The physical universe –An introduction to astronomy	University science books	1982	First Edition
2.	V. B. Bhatia	A Textbook of Astronomy and Astrophysics with Elements of Cosmology	Narosa Publishing House	2001	Revised Edition
3.	K.D.Abhyankar	Astrophysics: Stars and Galaxies	Universities Press	1999	First Edition

Reference Books

S.No	Authors	Title of the book	Publishers	Year of Publication	Edition
1.	L. Shapiro and S. A. Teukolsky	Black holes, white dwarfs and neutron stars	John Wiley	1983	First Edition
2.	S. Chandrasekhar	An introduction to the study of stellar structure	Dover publications	2003	First Edition

Pedagogy

Lecture, Lecture with discussion, Technical quiz

Course Designer

1. **Ms. J. AARTHI**
2. **Dr. B. ANITHA**