M. Sc. PHYSICS

SYLLABUS - 2014

SCHOOLS OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)

SCHOOL OF PHYSICAL SCIENCES
St. JOSEPH'S COLLEGE (Autonomous)
Accredited at 'A' Grade (3rd Cycle) by NAAC
College with Potential for Excellence by UGC
TIRUCHIRAPPALLI - 620 002, INDIA

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POST GRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from this academic year 2014 – 15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The **multi-discipline** nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours.

However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses a student must earn a minimum of 110 credits. The total number of courses offered by a department is given above. However within their working hours few departments / School can offer extra credit courses.

SUMMARY OF HOURS AND CREDITS PG COURSES - PHYSICS

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
1	I-IV	**Core Courses** Theory Practical	 9 4	 53 32	 53 16	
	II	**Self Paced Learning**	1	-	2	
	III	**Common Core**	1	5	5	**81**
	IV	**Comprehensive Examination**	1	-	2	
	IV	**Dissertation & Viva Voce**	1	6	3	
2	III-IV	**Core Electives**	3	12	12	**12**
3	I-III	**IDC (WS)** **IDC (Common)** **IDC (BS)**	1 1 1	4 4 4	4 4 4	**12**
4	I-IV	**Additional Core Courses**	-	-	-	
5	IV	SHEPHERD & Gender Studies	1	-	5	**5**
		TOTAL		**120**		**110**

IDC – Inter Departmental Courses
BS – Between School
WS – Within School

Total Hours : **120**
Total Credits : **110**

However, there could be some flexibility because of practicals, field visits, tutorials and nature of project work. For PG courses a student must earn a minimum of 110 credits. The total number of courses offered by a department is given above. However within their working hours few departments / School can offer extra credit courses.

Course Pattern

The Post Graduate degree course consists of five vital components. They are cores courses, core electives, additional core courses, IDC's and SHEPHERD. Additional Core courses are purely optional on the part of the student. SHEPHERD, the extension components are mandatory.

CORE COURSE

A core course is the course offered by the parent department related to the major subjects, components like theories, practicals, self paced learning, common core, comprehensive examinations, dissertations & viva voce, field visits, library record form part of the core courses.

CORE ELECTIVE

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the School. There are three core electives. It is offered in different semester according to the choice of the school.

ADDITIONAL CORE COURSES (If any)

In order to facilitate the students gaining extra credit, the additional core courses are given. The students are encouraged to avail this option of enriching with the extra credits.

INTER DEPARTMENTAL COURSES (IDC)

IDC is an interdepartmental course offered by a department / School for the students belonging to other departments / school. The objective is to provide mobility and flexibility outside the parent department / School. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various departments.

There are three IDC's. Among three, one is the Soft-Skill course offered by the JASS in the II Semester for the students of all the Departments. The other one is offered "With-in the school" (WS) and the third one is offered "Between the school" (BS). The IDC's are of application oriented and inter disciplinary in nature.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:

14	PXX	X	X	XX
↓	↓	↓	↓	↓
Year of Revision	PG Code of the Dept	Semester of the Part	Specification of Part	Running number in the part
14	**PPH**	**1**	**1**	**01**

For Example :

I M.Sc. Physics, first semester, Classical Mechanics
The code of the paper is 14PPH1101.
Thus, the subject code is fixed for other subjects.

Specification of the Part

1. Core Courses: (Theory, Practical, Self paced Learning, Common Core, Comprehensive Examination, Dissertation and Viva-voce)
2. Core Electives
3. Additional Core Courses (if any)
4. Inter Departmental Courses (WS, Soft Skill & BS)
5. SHEPHERD & Gender Studies

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks	
Passing Minimum: 50 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	**100**

MID-SEM & END – SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
4. The 10 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE / FALSE; and FILL-IN BLANKS.
5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: 30 Marks

Objective MCQs only

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected.

Part-B + C = 70 Marks

Descriptive

Part-B: 5 x 5 = 25 marks; inbuilt choice;

Part-C: 3 x 15 = 45 marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25

Part-B: 25 x 3 = 75 marks.

Duration of Examination must be rational; proportional to teaching hours 90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

EVALUATION

Percentage Marks, Grades & Grade Points

UG (Passing minimum 40 Marks)

Qualitative Assessment	Grade Points	Grade	Mark Range %)
Exemplary	10	S	90 & above
Outstanding	9	A+	85-89.99
Excellent	8	A	80-84.99
Very Good	7	B	70-79.99
Good	6	C	60-69.99
Pass (PG)	5	D	50-59.99
RA (PG)	0	RA	< 50

CGPA - Calculation

Grade Point Average for a semester is calculated as indicated here under:

$$\frac{\text{Sum total of weighted Grade Points}}{\text{Sum of Gredits}}$$

Weighted Grade Points is ***Grade point x Course Credits.*** The final CGPA will only include: Core, Core Electives & IDCs.

A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

POSTGRADUATE		
CLASS	Mark Range (%)	
	ARTS	SCIENCES
Distinction	75 & above, first attempt	80 & above, first attempt
First	60 - 74.99	60 - 79.99
Second	50 - 59.99	50 - 59.99

Declaration of Result:

Mr./Ms. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) is _____ and the class secured _____ by completing the minimum of 110 credits.

The candidate has also acquired _____ (if any) additional credits from courses offered by the parent department.

_____

M. Sc. Physics
Course Pattern - 2014 Set

Sem	Code	Course	Hours	Credits
I	14PPH1101	Classical Mechanics	6	6
	14PPH1102	Mathematical Physics	6	6
	14PPH1103	Analog & Digital Electronics	6	6
	14PPH1104	Physics Practical-I	8	4
	14PPH1401	IDC (WS): Physics for Competitive Examinations.	4	4
		Total for Semester 1	***30***	***26***
II	14PPH2105	Quantum Mechanics	6	6
	14PPH2106	Electrodynamics & Plasma Physics	6	6
	14PPH2107	Microprocessor & Microcontroller	6	6
	14PPH2108	Physics Practical-II	8	4
	14PPH2109	*Self paced learning**	--	2
	14PSS2401	IDC - Soft Skills	4	4
		Total for Semester 2	***30***	***28***
III	14PPH3110	Statistical Mechanics and Thermodynamics	5	5
	14PPS3101	Methods of Spectroscopy and Lasers	5	5
	14PPH3111	Physics Practical-III	8	4
	14PPH3201 A	Numerical & Statistical Methods OR	4	4
	14PPH3201 B	Medical Physics		
	14PPH3202 A	Non-Destructive Testing OR	4	4
	14PPH3202 B	Fiber Optic Communication		
	14PPH3402	IDC(BS): Modern Photography	4	4
		Total for Semester 3	***30***	***26***
IV	14PPH4112	Nuclear, Particle & Astrophysics	6	6
	14PPH4113	Condensed Matter Physics	6	6
	14PPH4114	Physics Practical IV	8	4
	14PPH4203 A	Nano Science & Nano Technology OR	4	4
	14PPH4203 B	Digital Photography		
	14PPH4115	Comprehensive Examination		2
	14PPH4116	Dissertation & *Viva Voce*	6	3
	14PCW4501	SHEPHERD and Gender Studies		5
		Total for Semester 4	*30*	*30*
		Total for all Semesters	**120**	**110**

Resource persons will be shared between Electronics and Physics Department.
WS – IDC within School
BS – IDC between Schools

* List of Self Paced courses Proposed:

1. Thin film physics and Crystal Growth (14PPH2109A)
2. Ultrasonic and Chemical Physics (14PPH2109B)
3. Lattice Dynamics (14PPH2109C)
4. Laser Physics (14PPH2109D)

Sem. I **Hours/Week: 6**
14PPH1101 **Credits: 6**

CLASSICAL MECHANICS

Objectives

- To understand the fundamental principles of classical mechanics.
- To understand the applications of classical mechanics.
- To learn and apply the concepts of Relativistic mechanics.

Unit-I: FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION (15 Hours)

Mechanics of a particle and system of particles - conservation Hlaws - constraints - generalized coordinates - D' Alembert's principle and Lagrange's equation - Hamilton's principle - Lagrange's equation of motion from Hamilton's principle - conservation theorems and symmetry properties.

Unit-II: TWO-BODY CENTRAL FORCE PROBLEMS (15 Hours)

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

Unit-III: HAMILTON'S FORMULATION (15 Hours)

Cyclic coordinates - Hamilton's canonical equations of motion - Hamilton's equations from variational principle - 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 Hours)

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 Hours)

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.

Book for Study

1. Herbert Goldstein: Classical Mechanics, 2nd Edition, New Delhi: Narosa Publishing House, 2001.

UNIT	BOOK	SECTIONS
I	1	1.1 -1.4, 1.6, 2.1, 2.3, 2.4, 2.6
II	1	3.2, 3.3, 3.7, 3.9, 3.10
III	1	8.2, 9.1, 8.5, 9.2, 9.4, 9.5, 10.1, 10.6, 10.7
IV	1	4.4, 5.3, 5.5, 5.7, 6.1- 6.4
V	1	5.2, 7.3, 7.5, 7.6, 7.8

Books for Reference

1. Rana, N.C. and Joag, P.S.: Classical Mechanics, (New Delhi, Tata McGraw Hill, 1998) (Units I, II & III).
2. Matrices & Tensors in physics by AW Joshi - Weiley Eastern.

———

Sem. I **Hours/Week: 6**
14PPH1102 **Credits: 6**

MATHEMATICAL PHYSICS

Objectives

- To understand various mathematical concepts and techniques in vector space, groups, functions and transforms.
- To apply these techniques to solve Physics problems.

Unit - I : LINEAR VECTOR SPACES AND MATRIX THEORY (15 Hrs)

Vector spaces: Linear dependence and independence of vectors - inner products - Schmitt's orthogonalization method - Schwartz in equality - linear transformations and matrices - orthogonal and unitary matrices - orthogonal and unitary transformations - transformation of vectors and matrices.

Matrix theory: Determination of Eigen values and Eigen functions - eigen vectors and their properties - diagonalisation of matrices - Matrices in Classical and Quantum Mechanics: Rotation matrix, Pauli Spin matrices, Dirac matrices - Matrix representation of an operator.

Unit II : GROUP THEORY (15 Hrs)

Definition and nomenclature - Rearrangement theorem - cyclic groups - subgroups - conjugate elements and class structure - identification of symmetry element and operations - molecular point groups - matrix representation of symmetry operations - The Great Orthogonality Theorem

- (qualitative treatment) - character of representation - character table - generating symmetry operators - construction of character tables - irreducible representation for C2v and C3v groups - symmetry species specifications.

Unit III : SPECIAL FUNCTIONS (15 Hrs)

Gamma and Beta functions - properties and their basic relations. DE and series solution of Legendre and Hermite - their polynomial, Rodrique's formula, generating function - recurrent relation - orthogonality relations.

Unit IV : TRANSFORMS (15 Hrs)

Fourier series: Dirichlet's condition - determination of coefficient - function having arbitrary period -Fourier series for square wave and half wave.

Fourier Transform: FT of a time dependent function - some important theorems: Parseval's, linearity, derivatives, shifting of origin and convolution use of FT in solving partial differential equation for heat conduction.

Laplace transform: Theorems - inverse transform - solution to ordinary differential equations - solving equations for LCR circuit.

Unit V: COMPLEX ANALYSIS (15 Hrs)

Cauchy - Riemann conditions - Cauchy's I integral theorem - applications to multiply connected region - Cauchy's II integral theorem - derivatives of analytic Complex function - Singular points and their classification - Laurent series - Cauchy's residue theorem - calculation of residue at a point - evaluation of definite integrals: (i) around the unit circle, (ii)around a semicircular contour, and (iii) integral of the form $\int_{-\infty}^{\infty} F(x)dx$.

Books for study

1. Joshi AW - Matrices and Tensors in Physics - New Age Int. Ltd. Pub., New Delhi, 3/e, 2006.
2. Tinkham M - Group Theory and Quantum Mechanics - McGraw Hill - New Delhi. 1964.
3. Aruldhas G - Molecular Structure and Spectroscopy - Prentice Hall of India, New Delhi, 2/e, 2009.
4. Bell W & Van Dale - Special Functions for Engineers and Scientists - Nostrand Company Ltd., 1969.
5. Mathematical Methods for Engineers and Physicists - A.K Mukhopadhyay, Wheeler Publications, New Delhi. 1998.

UNIT	BOOK	SECTIONS
I	1	1.3-1.7,5.3-5.8,9.1-9.3,14.1-14.4
II	2	Ch. 1, Ch2: 1- 4
II	3	Ch 5: 5.1 – 5.13
III	4	2.1 – 2.4, 3.1 – 3.5, 3.7, 5.1 – 5.6
IV	5	Ch. 7, 13: 7.1 – 7.10, 13.1 – 13.14
V	5	Ch. 14.2 – 14.5 (relevant portions)

Books for Reference

1. Mathematical Physics, H.K.Dass, S.Chand, New Delhi, 2006.
2. Mathematical Physics, Satya Prakash, Sultan Chand, New Delhi, 2008.

———

Sem. I **Hours/Week: 6**

14PPH1103 **Credits: 6**

ANALOG AND DIGITAL ELECTRONICS

Objectives

- To understand various techniques and concepts in Electronics.
- To apply these techniques in practical circuits.
- To develop the skill in handling instruments.

Unit I : ELECTRONIC DEVICES (15 Hrs)

SCR- Characteristics - parameters - control circuits using SCR, TRIAC and DIAC, UJT- characteristics -parameters - Relaxation oscillator - UJT control of SCR, LED, LCD, voltage variable capacitors diodes.

Unit II : OP-AMP APPLICATIONS AND VOLTAGE REGULATION (15 Hrs)

Basic operational amplifier circuit, IC 741, Direct coupled voltage follower, non-inverting and inverting circuits, Difference amplifier, Summing amplifier, Schmitt trigger. Sine wave generators - Op-amp phase shift oscillator and Op-amp Wein's bridge oscillator. Voltage regulators - Transistor Series regulator with error op-amp amplifier, The 723 IC Regulator, Three terminal Regulators.

Unit III : DAC, ADC AND TIMER CIRCUITS (15 Hrs)

DAC and ADC - Introduction, Digital to analog converters- Weighted Resistor DAC - R-2R ladder DAC -Specifications for D/Aconverters. Sample and hold circuit, Analog to Digital converters.

Timing circuits - Introduction, Applications of logic gates in timing circuits, Op-amp and its applications in timing circuits, 74121 Monostable multivibrator IC, Astable multivibrator using one shot, 555 Timer.

Unit IV: COMBINATIONAL LOGIC DESIGN (15 Hrs)

Simplification of logical functions using K map, EX-OR and EX-NOR simplification of K maps, Quine - McCluskey minimization technique, Combinational logic design using MSI circuits - Multiplexers - Demultiplexers / Decoders, BCD Arithmetic, ALU, Digital comparators, Parity generators / checkers, Code converters, Priority encoders, Decoder / drivers for display devices.

Unit V: SEQUENTIAL LOGIC DESIGN, SEMICONDUCTOR MEMORIES AND DIGITAL EQUIPMENTS (15 Hrs)

Registers, Applications of shift registers, Asynchronous counters, Synchronous counters, Synchronous counter design, Clocked sequential circuit design, Memory devices - Introduction, ROM, Memory expansion, Applications of ROMs, RAM, RAM IC 7489, Charge Coupled Devices. Digital building blocks, Digital voltmeters, Frequency counter, period counter, Digital clock, Digital audio.

Books for Study

1. David A. Bell, Electronic devices and circuits, 3rd edn, Prentice Hall of India, New Delhi, 1999.
2. R.P. Jain, Modern Digital Electronics, 3rd edn, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2003.
3. Virendrakumar, Digital Technology, New Age International Pvt. Ltd., New Delhi, 1995.

Unit	Book	Sections
I	1	18.1 – 18.4,18.6 – 18.10,19.8, 19.9, 20.3
II	1	13.1,13.2,13.4-13.7,13.9,15.1,15.4,16.4,16.7,16.8
III	2	9.1-9.3,9.5.1,9.5.4,9.6,10.1,10.2,10.4,10.5
IV	2	5.3-5.9, 5.11, 6.1-6.3,6.4.2,6.5-6.11
V	2 3	8.1-8.4,8.5.1,8.6 14.1,14.2,14.5,14.6,14.9,14.18,Chapter 16

Books for Reference

1. Roy Choudhury, D and Shall Jain, Linear Integrated Circuits, Wiley Eastern Ltd., New Delhi, 2005.
2. Thomas L. Floyd and R.P. Jain, Digital Fundamentals, Eighth Edition, Pearson Education Pvt. Ltd., 2008.

———

Sem. I **Hours/Week: 8**
14PPH1104 **Credits: 4**

PHYSICS PRACTICALS-I

Objectives

- To understand various techniques and concepts in Electronics
- To understand various techniques and concepts in General Physics experiments
- To develop the skill in handling instruments.

Any 15 Experiments.

1. Absorption Spectrum of Iodine.
2. χ - Quincke's method.
3. e/m Magnetron and ϕ - Work function.
4. Dielectric Constant Study - Solid, Liquid, Wave meter and Lecher wire .
5. Hall effect in semiconductor.
6. Elastic Constants - Elliptic fringes.
7. Laser - I :Diameter of wire, diffraction.
8. Planck's constant & Photo sensitive devices.
9. Ultrasonic interferometer.
10. BJT Amplifier design.
11. UJT - Characteristics and Applications.
12. Regulated PS - Zener and IC.
13. K- map simplification - implementation basic and universal gates by SOP & POS.
14. Encoder and Decoder.
15. ALU and Scalar.
16. 555 - Astable and its applications.
17. Op-amp: Basic circuit design.
18. Op-amp: I to V, V to I and Square wave.
19. Wien's Bridge Oscillator : Op-amp.
20. Computer: Numerical Problem - I.
21. Thin film experiments - Thin film research lab

———

Sem. I **Hours/Week: 4**
14PPH1401 **Credits: 4**

IDC-1 (WS):

PHYSICS FOR COMPETITIVE EXAMS

Objectives

- To understand the basic principles of physics
- To develop the competitive examination skills
- To Sharpen the thought process toward the objective type questions.

Unit - I:

GENERAL MECHANICS AND PROPERTIES OF MATTER

Physical quantities, SI units, Dimensions, Scalars and Vectors (Concepts), Newton's Equations of Motion, impulse, Principle of conservation of Linear momentum, Projectiles, Kepler's Laws, Newton's Law of Gravitation, acceleration due to gravity, Escape velocity, Angular momentum, banking of roads, simple harmonic motion, Viscosity, Surface Tension.

Unit - II:

HEAT AND THERMODYNAMICS

Different scales of temperatures, thermal expansions, Calorimetry - specific heat, latent heat, triple point, transmission of heat, heat conductivity, Black bodies, Stefan-Boltzmann Law, Wien's Displacement Law, Gas Equation, Boyle's Law, Charle's Law, Law of equipartition of energy.

Unit - III:

LIGHT AND SOUND

LIGHT: Reflection, Refraction and total internal reflection of light and their applications, propagation of light, Refractive index, Prism, Lenses, mirrors, Aberration in Lenses, Optical instruments - microscopes, telescopes, binoculars, Defects of Human Eye.

SOUND: Wave motion, longitudinal and Transverse waves, velocity of sound- Newton's formula, Laplace correction, effects of pressure - beats, laws of vibrating strings, open and closed organ pipes, Resonance.

Unit - IV:

ELECTRICITY AND MAGNETISM

Electric charge, field, potential, Resistances, Capacitance , Cells and their combinations, Kirchoff's laws, Ohm's law, Faraday's laws, Lenz's law, Galvanometer, Voltmeter, Ammeter, Current Electricity.

Earth's Magnetism, Bar magnet, Magnetic moment, Magnetic field, magnetic substances, torque of a bar magnet placed in a magnetid field, electromagnet.

Unit - V:

MODERN PHYSICS AND ELECTRONICS

Bohr's theory, H-spectrum, Nuclear Physics, Binding Energy, X - rays, Alpha, Beta and Gamma rays, Einstein's photo electric effect and mass-energy relations.

Semi-conductors, Diodes, Transistors, Rectifiers, Amplifiers, Oscillators, Boolean Algebra, Logic gates, Electronics in Communication.

Book for Study

PHYSICS FOR COMPETITIVE EXAMS - Department of Physics, St. Joseph's College, Tiruchirappalli -2.

———

Sem. II **Hours/Week: 6**

14PPH2105 **Credits: 6**

QUANTUM MECHANICS

Objectives

- To understand basic idea of Dirac formalism in Quantum Mechanics.
- Apply the same formalism to study the angular momentum concept, scattering of fundamental particles and necessary relativistic modification in particle behaviour.
- To understand the relativistic wave equations

Unit - I : DIRAC'S FORMALISM (15 Hrs)

Fundamental postulates of QM - Bra and Ket notations - Linear operators - Orthogonality of eigen functions - observables - the completeness condition - simultaneous eigenkets of commuting observables - eigen value problem - uncertainty product - harmonic oscillator wave functions -the number operator - the unitary transformation- Schrodinger and Heisenberg Pictures.

Unit - II : ANGULAR MOMENTUM (15 Hrs)

The angular momentum operator - eigen values and eigen functions of Lz- The commutation relations - angular momentum and rotations - ladder operators - the constants C+ and C - - angular momentum matrices corresponding to j = ½ Pauli spin matrices - Pauli wave function and Pauli equation - addition of angular momenta - Clebsh - Gordan Coefficients for j1 = j2 = ½ - concept of isospin.

Unit - III : APPROXIMATION METHODS (15 Hrs)

JWKB solutions - the connection formulae - application of JWKB solutions to eigen value problems. Time independent perturbation theory - non-degenerate (first and second order) states - degenerate states - fine structure of the hydrogen atom. Variational method - Applied to hydrogen atom. Time dependent perturbation theory: time development of states, transition probability- adiabatic and sudden approximation.

Unit - IV : THEORY OF SCATTERING (15 Hrs)

Definition and interpretation of scattering cross section - quantum theory of scattering - The Green's function - The Born approximation- applied to shielded Coulomb potential. Method of Partial Waves : expansion formula for a plane wave, scattering by a hard sphere, a square well & the Ramsauer effect, neutron by proton - Coulomb scattering.

Unit - V : RELATIVISTIC WAVE EQUATIONS (15 Hrs)

The Klein - Gordan equation - the Dirac Equation - Dirac's α and β matrices - probability and current density - plane wave solution - the electron in an electromagnetic field - the spin orbit interaction - central potential - energy levels of the hydrogen - the hole theory and positrons.

Books for Study

1. Ajoy Ghatak and S. Lokanathan, Quantum Mechanics : Theory and Applications, Macmillan India Ltd., New Delhi, 2007.

Unit	Chapters	Sections
I	11, 12	11.1 – 11.6, 11.8 – 11.10, 12.1 – 12.4, 12.7– 12.9
II	9, 13, 18	9.1-9.7, 13.1-13.4, 13.6,13.8,13.9,18.1 – 18.6
III	17, 19, 21, 25	17.1 - 17.4, 19.1-19.3, 19.5, 21.1 - 21.3, 25.1, 25.2, 25.4 - 25.7
IV	24	24.1 – 24.7
V	28	28.1 -28.10, 28.12-28.14

Books for Reference

1. Richard L Liboff, Introduction to Quantum Mechanics, Pearson Education Ltd., 4/e, 2006.
2. AFJ Levi, Applications of Quantum Mechanics, Cambridge University Press, Delhi, 2009.
3. Thankappan, V.K. - Quantum Mechanics, Wiley Eastern Ltd., New Delhi, 2nd Edn, 1995.
4. G. Aruldhas, Quantum Mechanics, Prentice Hall of India, New Delhi, 2003.

———

Sem. II **Hours/Week: 6**

14PPH2106 **Credits: 6**

ELECTRODYNAMICS AND PLASMA PHYSICS

Objectives

- To know the basics of electrostatics and magnetostatics.
- To acquire knowledge of wave propagation in different media and flow of power.
- To understand reflection of EM waves in conductor and dielectric and the analogue of EM wave.
- To understand the modes of propagation of guided waves and propagation through wave guides.
- To understand the concepts of plasma physics.

Unit I: ELECTROSTATICS AND MAGNETOSTATICS

Gauss's law & its applications - the potential function- Laplace & Poisson's equations - condition at a boundary between dielectrics - Divergence theorem - electrostatic uniqueness theorem - magnetic field strength and magneto motive force - Ampere's law - Biot Savart law - Ampere's law in differential vector form - magnetic scalar and vector potential - electromagnetic induction - Lorentz transformation and relations for relative motion.

Unit II: APPLIED ELECTROMAGNETIC WAVES

Equation of continuity for time varying fields - inconsistency of Ampere's law - Maxwell's equations - derivations - electromagnetic waves in free space - uniform plane wave propagation and its characteristics - wave equations for conducting medium - Maxwell's equation in phasor form - wave propagation in lossless, conducting and dielectric media - depth of penetration.

Unit III: ELECTROMAGNETIC WAVES IN BOUNDED MEDIA & POWER FLOW

Poynting's theorem - statement and proof - Interpretation of Poynting's vector - Power flow for a plane wave - power flow in a concentric cable and conductor having resistance - Instantaneous, average and complex Poynting vector - power loss in a plane conductor and a resonator - Boundary conditions - proof - reflection of plane waves by a perfect conductor for normal and oblique incidence - reflection of plane waves by a perfect dielectric for normal and oblique incidence - Brewster's angle.

Unit IV : GUIDED WAVES AND WAVE GUIDES

Waves between parallel planes - Transverse electric waves - Transverse magnetic waves-characteristics of TE and TM waves - Transverse electromagnetic waves - Attenuation in parallel plane guides - Attenuation for TE waves, TM waves and TEM waves - Rectangular guides - Transverse magnetic waves and Transverse electric waves in rectangular guides - Field configurations for dominant TM and TE modes - Impossibility of TEM wave in wave guides - Transmission line analogy for wave guides - Q factor of wave guides

Unit V : PLASMA PHYSICS

Introduction - kinetic theory of plasma - principle of detailed equilibrium - mathematical aspects of plasma physics - Maxwell's equation - hydrodynamic equation - momentum transfer equation - equations of continuity - production of plasma- plasma oscillation - electrical conductivity of plasma - thermal pinch effect - dielectric properties - magnetic properties - observation of plasma radiation using diagnostic technique.

Books For Study

1. Edward C, Jordan & Keith G., Balmain, Electromagnetic Waves and Radiating Systems - Second Edition, Prentice Hall of India, New Delhi, 1997.
2. B.S.Saxena, P.N.Saxena & R.C.Gupta, Fundamentals of Solid State Physics, Pragati Prakasan publn, 2001.

Unit	Book	Sections
I	1	2.03, 2.04, 2.07, 2.08, 2.11, 2.13, 3.04, 3.05, 3.10, 3.11, 3.12, 3.14, 18.06, 18.10, 18.13
II	1	4.01 – 4.03, 5.01– 5.06
III	1	4.04, 5.09 – 5.15, 6.01 – 6.04
IV	1	7.01 – 7.05, 7.07, 8.01 – 8.04, 8.09, 8.10
V	2	19.1, 19.8, 19.9, 19.11, 19.13, 19.14

Books For Reference

1. David I.Griffiths, Introduction to Electrodynamics, Prentice Hall of India, New Delhi, 2003.
2. B.B.Laud, Electromagnetics, second edition, Wiely Eastern Limited, 1990.

———

Sem. II **Hours/Week: 6**
14PPH2107 **Credits: 6**

MICROPROCESSOR AND MICROCONTROLLER

Objectives

- To understand the Microprocessor and Microcontroller architecture.
- To program the processor and controller.
- To know the interfacing applications.

Unit-I: MICROPROCESSOR ARCHITECTURE, INSTRUCTION SET AND INTERFACING (15 Hrs)

Intel 8085 Microprocessor Architecture, Pin configuration, Instruction cycle, Timing diagram, Instruction and data formats, Addressing modes, Status flags, Intel 8085 instructions. Address Space partitioning, Memory and I/O Interfacing, Data transfer schemes, Interrupts of Intel 8085. Generation of control signals for memory and I/O devices.

Unit-II: MICROPROCESSOR PROGRAMING (15 Hrs)

Assembly language, Stacks, Subroutines, MACRO, Delay Subroutine. Examples of Assembly language Programming- addition-subtraction - complement- shift -mask-look-up table- To find the largest and smallest number in a data array- sorting-sum of a series-Multiplication- Division-multi-byte addition and subtraction.

Unit - III: MICROCONTROLLER - 8051 (15 Hrs)

Microprocessor and Microcontroller - Overview of 8051 Family - Pin Description of 8051 - Registers - Program Counter, ROM space, RAM space, Stack, PSW, SFR - Addressing Modes - Jump Call Instructions - Time delay generations and Calculations - Arithmetic and Logic Instructions - Bit Instructions - Assembly Language Programming - Data Types and Directives.

Unit - IV: Microcontroller SFRs and Programming (15 Hrs)

Counter / Timer - Counter Programming - Basics of Serial Communication - RS232 Connections and ICs Max 232 - 8051 Serial Communication Registers - Serial Communication Programming - Interrupts - Interrupts Registers - Internal and External Interrupt Programming.

Unit-V: MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS (15 Hrs)

Microprocessor Interfacing and Applications

Programmable peripheral interface Intel 8255, Interfacing 7 segment LED

display, Measurement of frequency, voltage and current, Measurement of temperature. Microprocessor based traffic control, To generate square wave or pulse using Microprocessor.

Microcontroller Interfacing and Applications

Interfacing - LCD, ADC 0809, Stepper Motor, Keyboard and DAC.

Books for Study

1. B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications (P) Ltd., New Delhi (2005).
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi - The 8051 Microcontroller and Embedded Systems, Pearson Education, Delhi, Seventh Indian Reprint 2004.

Unit	Book	Sections
I	1	3.1, 3.3, 4.1, 4.4, 4.6, 7.2, 7.5, 7.6.1
II	1	5.2, 5.5, 5.6, 5.14, 9.2, 6.1-6.32, 6.34, 6.35
III	2	1.1, 1.2, 4.1, 2.1, 2.4, 2.7, 2.6, 5.1, 5.2, 3.1, 3.2, 3.3, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3, 8.1, 8.2, 2.2, 2.3, 2.5
IV	2	Chapter 9, 10, 11
V	1 2	7.7.1-7.7.4, 8.8, 9.3, 9.5.1, 9.5.3, 9.6.1, 9.8, 9.9 Chapter 12, 13

Books For Reference

1. A.P.Godse and D.A.Godse, Microprocessors and its applications (First edition), Technical Publications, Pune, 2006.
2. A.Nagoor Kani, Microprocessors & Microcontrollers, 1st edition, RBA Publications, Chennai, 2006.

———

Sem. II **Hours/Week: 8**

14PPH2108 **Credits: 4**

PHYSICS PRACTICALS-II

Objectives

- To understand various techniques and concepts in Electronics.
- To understand various techniques and concepts in General Physics experiments.
- To develop the skill in handling instruments.

Any 15 Experiment

1. Spectrum Photo - Cu / Fe Arc Spectrum
2. χ - Guoy's method
3. Michelson Interferometer
4. Biprism - Optic bench
5. Energy Gap study of a semiconductor
6. Elastic Constants - Hyperbolic fringes
7. Laser - II : Wave length of He-Ne, thickness
8. e - Millikan's oil drop method
9. Ultrasonic diffraction
10. FET Amplifier design
11. SCR - Characteristics and Applications
12. Transmission Line Characteristics
13. Parity Checker / Generator & Comparator by gates
14. BCD Adder and Subtractor
15. Shift Registers using Flip-Flop & ICs - III
16. 555 - Monostable and its applications - III
17. Op-amp: Parameters calculation
18. Op-amp : Low &High and band pass Filters - III
19. Phase Shift Oscillator : Op-amp
20. Computer: Numerical Problem - II
21. Ultrasonic Experiments - Ultrasonic research lab

———

Sem. II

14PPH2109A **Credits: 2**

Self Paced Course:

PHYSICS OF THIN FILM AND CRYSTAL GROWTH

Objectives

- To learn the preparative techniques of thin films and crystal.
- To develop the theoretical concepts of thin films and crystal.
- To learn the characterizing techniques.

Unit-I: Preparative techniques of thin film

Physical methods-Vacuum evaporation - sputtering - chemical methods-chemical vapour deposition - Electro and electroless coating - hybrid methods-dip coating - spin coating.

Unit-II: Thickness measurement and Nucleation growth

Gravimetric - microbalance - electrical - resistance - capacitance method-optical - Fieazu fringes method- Four stages of film growth - Incorporation of defects during growth.

Unit-III: Theory of nucleation in crystal growth

Theories of nucleation - classical theory of nucleation - Gibbs Thomson equation for vapour - Modified Thomson equation for melt - Gibbs-Thomson equation for solution - Energy of formation of a nucleus - Spherical nucleus - Cylindrical nucleus - Heterogeneous nucleation.

Unit-IV: Preparative techniques of Crystal

Crystal growth from melt: Czocharlski technique-Bridgmann-stockbarger technique - Crystal growth from Solution: Low temperature solution growth - Slow cooling technique - Slow evaporation technique - High temperature solution growth - Gel growth.

Unit-V: Characterization Techniques

Structural -XRD - Micro hardness - electrical - DC and AC conduction-Four Probe technique - impedance analysis - LCR bridge measurement - optical-FTIR -functional analysis - UV-Visible - transmittance - reflectance - Absorbance.

Book for study

- Study material prepared by the department.

———

Sem. II

14PPH2109B **Credits: 2**

ULTRASONICS - FUNDAMENTALS, SOURCES, MEASUREMENT AND APPLICATIONS

Objectives

- To learn the fundamentals of Ultrasound and Transducers.
- To develop the theoretical concepts of Ultrasonics
- To learn the applications of Ultrasonics and NDT.

Unit I: FUNDAMENTALS OF ULTRASOUND

Introduction - Classification of sound waves - Ultrasonic waves - Different modes of Ultrasonic waves -Characteristics Properties of Ultrasonic waves - Velocity - Specific acoustic impedance - Acoustic intensity and pressure - Behaviour of Ultrasonic waves - Reflection and transmission at normal incidence -Diffraction.

Unit II: ULTRASONIC TRANSDUCERS

Piezoelectric Effect - Piezoelectric crystals — Advantages and limitations of quartz - Transducer Materials - Piezoelectric ceramic materials - Polymer materials - Materials for transmission and reception - Thickness selection of a Piezoelectric Element.

Unit III: MEASUREMENT TECHNIQUES OF ULTRASOUND

Detection of Ultrasonic Waves - Optical Method - Electrical Method - Pulse echo overlap method - Resonance ultrasound spectroscopy - Laser Interferometry.

Unit IV: APPLICATIONS OF ULTRASOUND - GENERAL AND ADVANCED

Classification of Ultrasonic Applications -Welding - Cleaning - Flow meters - Food industry - Concrete testing — Echo sounder - Length meters - Applications - Level meters - Thickness measurements - Ultrasonic microscopy.

Unit V: ULTRASONIC NON-DESTRUCTIVE TESTING

Classification of Non-Destructive Testing - Ultrasonic Testing - Classification of Ultrasonic Testing - Pulse echo -Resonance - Surface wave - Different Types of Techniques in Pulse Echo Method - Flaw Detectors - Functions of a flaw detector - Different types of scans - Applications of Flaw Detectors.

Book for Study

1. Baldev Raj, V Rajendran and P Palanichamy, Science and Technology of Ultrasonics, 2nd edition, Narosa Publishing House, New Delhi, 2009.

———

Sem. II **Hours/Week: 4**
14PSS2401 **Credits: 4**

IDC-1:

SOFT SKILLS

Objectives

* Introducing learners to the relevant soft skills at the territory level in order to make them gain competitive advantage both professionally and personally.

Module 1: Basics of communication and Effective communication

Basics of communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication. Effective communication: Johari Window, The Art of Listening, Kinesthetic, Production of Speech, Organization of Speech, Modes of delivery, Conversation Techniques, Dialogue, Good manners and Etiquettes.

Module II: Resume writing and Interview skills

Resume Writing: What is Resume? Types of Resume? Chronological, Functional and Mixed Resume, Steps in preparation of Resume. Interview Skills: Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Module III: Group discussion and team building

Group Discussion: Group Discussion Basics, GD Topics for Practice, Points for GD Topics, Case-Based and Article based Group Discussions, Points for Case Studies, and Notes on Current Issues for GDS. Team Building: Team Vs Group - synergy, Stages of Team Formation, the Dabbawala. Leadership - Styles, Work ethics. Personal Effectiveness: Personal Effectiveness: Self Discovery, Self Esteem, and Goal setting. Conflict and Stress Management.

Module IV: Numerical Ability

Average, Percentage, Profit and Loss, Simple Interest, Compound Interest, Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Boats and Streams Calendar, Rations and Proportions.

Module V: Test of reasoning

Verbal Reasoning: Series Completion, Analogy, Data Sufficiency, Assertion and Reasoning, Logical Deduction. Non-Verbal Reasoning: Series, Classification

References

1. Aggarwal, R.S. 2010 Quantitative Aptitude, S.Chand & Sons
2. Aggarwal, R.S. 2010. A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand
3. Covey, Stephen. 2004. 7 Habits of Highly effective people, Free Press.
4. Egan, Gerard. 1994. The Skilled Helper (5th Ed). Pacific Grove, Brooks / Cole.
5. Khera, Shiv 2003. You Can Win. Macmillan Books , Revised Edition
6. Murphy, Raymond. 1998. Essential English Grammar. 2nd ed., Cambridge Univ. Press.
7. Prasad, L. M. 2000. Organizational Behaviour, S.Chand
8. Sankaran, K., & Kumar, M. 2010 Group Discussion and Public Speaking. M.I. Pub, Agra, Adams Media.
9. Schuller, Robert. (2010). Positive Attitudes. Jaico Books.
10. Trishna's (2006). How to do well in GDs & Interviews, Trishna Knowledge Systems.
11. Yate, Martin. (2005). Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting.

Sem. III **Hours/Week: 5**
14PPH3110 **Credits: 5**

STATISTICAL MECHANICS & THERMODYNAMICS

Objectives

- To review the fundamental concepts of thermodynamics in order to understand Statistical Mechanics.
- To understand the principles of classical statistical mechanic and its application to compute the various parameters of molecules.
- To understand the need for quantum Statistical Mechanics and its various applications.
- To know the concept of Boltzmann transport equation and its applications and the principle of fluctuations in thermodynamic quantities.
- To acquire knowledge about the phase transition of a system and its models.

UNIT I: FOUNDATION AND FUNDAMENTALS OF STATISTICAL MECHANICS (15 Hrs)

Entropy and second law of the thermodynamics- Entropy and disorder- thermodynamic potentials and the reciprocity relation- thermodynamic equilibrium-Nernst's heat theorem- chemical potential-phase space-volume in phase space-concept of ensembles-micro canonical- canonical- grand canonical- Liouvilles theorem- micro and macro states- Gibb's paradox.

UNIT II : CLASSICAL STATISTICAL MECHANICS (15 Hrs)

Classical Maxwell-Boltzmann distribution law- evaluation of constants- distribution of velocities- principle of equipartition of energy-connection between the partition function and thermodynamic quantities- mean values obtained from distribution law- Boltzmann's entropy relation.

UNIT III: QUANTUM STATISTICAL MECHANICS (15Hrs)

Statistical weight-Bose-Einstein Statistics-Fermi-Dirac Statistics- Maxwell-Boltzmann statistics- black body radiation and Planck's radiation law-energy and pressure of Bose-Einstein and Fermi-Dirac-gas degeneracy- Bose-Einstein condensation-electron gas

UNIT IV: TRANSPORT PROPERTIES AND FLUCTUATIONS IN THERMODYNAMIC QUANTITIES (15 Hrs)

Boltzmann transport equations-Boltzmann transport equations for electrons and Lorentz solution-chambers equation-thermal conductivity of metals-

fluctuations in energy, pressure -probability of one dimensional random walk - Brownian movement- Fokker Planck equation- Nyquist's theorem.

UNIT V: PHASE TRANSITIONS AND ITS MODELS (15 Hrs)

Phase transitions-first and second kind - YANG and LEE theory - critical exponent-phase transition of second kind- Ising model - Bragg Williams approximation- one dimensional Ising model. Super fluidity: Tisza's two fluid model and second sound - Landu's theory.

Book for Study

1. Gupta S.L & Kumar V., Statistical Mechanics, Pragati Prakashan, Meerut, 2006.

Unit	Book	Sections
I	1	A.2 –A.7, 1.1, 1.1-1, 1.3, 1.3-1, 1.3-2, 1.3-3, 1.7, 2.1, 3.0.3
II	1	2.7, 2.9, 2.10, 2.12, 2.14, 2.15-2.16
III	1	5.9, 6.2, 6.3, 6.4, 6.10, 8.0-8.2, 9.0, 9.3
IV	1	10.1-10.3, 10.5, 12.1, 12.2, 12.5 – 12.7, 12.10
V	1	13.1-13.7, 8.4.0, 8.4.1, 8.4.2

Books for Reference

1. Gopal E S R,Statistical Mechanics & Properties of Matter, McMillan, New Delhi, 1976.
2. Agarval B K & Melin Eisner., Statistical Mechanics, Wiley Eastern Ltd, New Delhi, 1989.
3. Palash b.Pal An introductory course of statistical mechanics, Narosa, New Delhi, 2008.

———

Sem. III **Hours/Week: 5**
14PPS3101 **Credits: 5**

METHODS OF SPECTROSCOPY AND LASERS

Objectives

- To learn the various spectroscopic techniques.
- To learn the applications of spectroscopy.
- To learn the concept of laser devices and its applications.

Unit I: Rotational and Vibrational spectroscopy

Basic aspects of spectroscopy-characterization of EM radiation,quantization of energy-Microwave spectroscopy-rotation of molecules and selection rules,diatomic molecules;Rigid and Non-rigid rotator-rotational constant-centrifugal distortion constant-techniques and instrumentation (FT-IR). Vibration Spectroscopy - diatomic molecules; Harmonic and anharmonic oscillators, Zero point energy - force constant - fundamental absorption and overtones (hot bands, Fermi resonance)- polyatomic molecules - Techniques and instrumentation.

Unit II: Raman and NMR Spectroscopy

Raman spectroscopy: Raman Rayleigh scattering- Quantum and Classical theory of Raman effect- Pure rotational Raman spectra - Stokes and anti-Stokes lines - Vibration Raman spectra - mutual exclusion principle- Polarized and depolarized Raman lines - Techniques and instrumentation.

NMR Spectroscopy- Hydrogen nuclei- chemical shift-spin-spin splitting-coupling constant-Instrumentation- Interaction between spin and magnetic field- Gyromagnetic ratio- FT-NMR.

Unit III: ESR and Mossbauer Spectroscopy

ESR- Principle-position of ESR absorptions-g value- hyperfine splitting-zero field splitting- ESR spectrum of free radicals and complex.

Mossbauer Spectroscopy-Principle-Doppler shift-recoil energy-isomer shift-quadrupole splitting-hyperfine splitting-Applications.

Unit IV: Electronic Spectroscopy

Electronic spectra of diatomic molecules- Born-Oppenheimer approximation - vibrational coarse structure-Frank-Condon Principle-dissociation energy and dissociation product-rotational fine structure ration transtitions-Fortrat diagram-electronic angular momentum in diatomic molecules-spectrum of molecular hydrogen-molecular photo electron spectroscopy - UV photo electron spectroscopy - X-ray photo electron spectroscopy.

Unit V: Laser devices and their applications

Principle - pumping - He-Ne laser- Carbon-di-oxide laser- semi conductor laser- Holography-recording and reconstruction- applications-laser induced fusion-fusion process-stimulated raman scattering-lasers in isotope separation - Lidar-laser tracking-lasers in industry and medicine

Books for Study

1. Colin N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, TMH Edition, 4th Edition (1994).
2. Ghatak & Thyagarajan, Lasers Theory and applications, Macmillan India Ltd., (1997).

Books for Reference

1. Straughan B.P and Walker.S, Spectroscopy Vol. 1,2,3, Chapman and hall, London (1996).
2. Gurdeep R. Chatwal and Sham K. Anand, Spectroscopy, Himalaya Publishing House (2009).

———

Sem. III **Hours/Week: 8**
14PPH3111 **Credits: 4**

PHYSICS PRACTICALS-III

Objectives

- To understand various techniques and concepts in Electronics.
- To understand various techniques and concepts in General Physics experiments.
- To develop the skill in handling instruments.

Any 15 Experiment

1. e/m Zeeman effect
2. Microwave - Klystron
3. Laser III: Refractive index,Brewster's ang
4. Multiplexer and Demultiplexer
5. Digital to Analog Converters
6. ROM - Construction and Study
7. Design of Asynchronous Counter
8. Power Amplifier : Transistor & IC
9. DIAC, TRIAC - Characteristics & Application
10. Mod & Demod: PAM,PPM,PWM
11. Geiger Muller Counter
12. μP - Programming- I : - II
13. μP - Programming -II:
14. μP - Interfacing - I : Traffic controller
15. μP - Interfacing - II: Stepper Motor - II
16. μP - Interfacing -III: Voltage / Temperature measurement
17. Multiplexed display
18. MC - Programming & Interfacing - I - II
19. MC - Programming & Interfacing - II
20. Computer: Numerical Problem - III
21. MC - Programming with C Simulator - I
22. Crystal Growth Experiments - Crystatl Growth research lab.

———

Sem. III **Hours/Week: 4**
14PPH3201A **Credits: 4**

Core Elective-1A:

NUMERICAL AND STATISTICAL METHODS

Objectives

- To understand different numerical methods and their applications.
- To understand different computational techniques for physics applications.
- To understand the statistical methods.

Unit I: NUMERICAL SOLUTION OF LINEAR AND NONLINEAR EQUATIONS (10 Hrs)

Newton - Raphson method: iterative rule - termination criteria - rate of convergence - Simultaneous linear algebraic equations: - Augmented matrix - Gauss elimination - Inverse of a matrix by Gauss-Elimination method.

Unit II : INTERPOLATION AND CURVE FITTING (10 Hrs)

Interpolation: Newton's interpolation - Linear interpolation - Higher-order polynomials - Divided differences — Gregory-Newton forward and backward interpolation formulae - error in interpolation — Lagrange interpolation.

Unit III: NUMERICAL DIFFERENTIATION, INTEGRATION AND ODE (10 Hrs)

Numerical integration: trapezoidal, Simpson's 1/3 rules - Truncation error - composite trapezoidal, and Simpson's 1/3 rules. ODE: Euler and fourth-order Runge-Kutta methods for first order ODE.

Unit - IV: LEAST SQUARES METHOD (10 Hrs)

Derivate of tabulated function - summation formula - Difference equation with constant coefficient - Curve fitting: Method of least-squares- normal equations - straight-line, exponential fits and power-law fits.

Unit - V: STATISTICAL METHODS (10 Hrs)

Discrete Probability distribution - Continuous distribution - Expectations - Moments and Standard Deviations - Binomial Distribution - Poisson Distribution - Gaussian Distribution

Books for Study

1. M.K. Venkataraman, Numerical Methods in Science & Engineering National Pub. Co. Madras, 1993. (for units I, II, and III).
2. Pipes, L.A. & Harvil, L.R., Applied Mathematics for Engineers and Physicists, McGraw Hill Company, New Delhi.

———

Sem. III **Hours/Week: 4**
14PPH3201B **Credits: 4**

Core Elective-1B:

MEDICAL PHYSICS

Objectives

- To acquire knowledge of forces, pressure and the importance of temperature in human body.
- To understand the physical principles involved in respiration and cardiovascular system.
- To understand how electric signals generate in human body and the working of EMG and ECG.
- To understand the application of sound and light in medicine and medical imaging and understand the use of X-rays and radioactivity for diagnostic and treatment.

Unit I:

MECHANICS OF HUMAN BODY (10 Hrs)

Static, dynamic and frictional forces in the body-composition, properties and function of bone-heart-temperature-temperature scales-clinical thermometer-thermography- heat theraphy- croyogenics in medicine- heat losses from body-pressure in the body-pressure in skull, eye and urinary bladder.

Unit II:

PHYSICS OF RESPIRATORY & CARDIOVASCULAR SYSTEM (10 Hrs)

Body as a machine-airways system-blood & lungs interaction-measurements of lung volume-structure and physics of alveoli-breathing mechanism-ventilators-types of ventilators- airway resistance-components & functions of cardiovascular systems-work done by heart-components & flow of blood-laminar and turbulent flow-blood pressure-direct and indirect method of measuring - heart sounds.

Unit III:

ELECTRICITY IN THE BODY (10 Hrs)

Nervous system & neuron-electrical potentials of nerves-electric signals from muscles, eye, heart-block diagram & working to record EMG- normal ECG wave form- electrodes for ECG- amplifier and recording device-block diagram and working to record ECG-patient monitoring-pace maker.

Unit IV:

SOUND AND LIGHT IN MEDICINE (10 Hrs)

General properties of sound - stethoscope - generation, detection and characteristics of ultrasound- ultrasound imaging technique-A scan &B scan method- properties of light-applications of visible, UV, IR & LASER in medicine-microscope-eye as an optical system-elements of the eye-ophthalmology instruments.

Unit V:

DIAGNOSTIC X-RAYS AND NUCLEAR MEDICINE (10 Hrs)

Production and properties of X rays-basic diagnostic X-ray machine-X ray image-live X-Ray image- X-ray computed tomography-characteristics of radio activity-radio isotopes and radio nuclides-radioactivity sources for nuclear medicine- basic instrumentation and clinical applications- priniciples of radiation therapy-nuclear medicine imaging devices-radiation sources - Basic principles of photodynamic therapy.

Books for study

1. Study Material prepared by the Department
2. Hand of biomedical instrumentation (section 33.3 & 33.4). R.S. Khandhur, 2010, Tata McGraw Hill Education Private Limited.

———

Sem. III **Hours/Week: 4**
14PPH3202A **Credits: 4**

Core Elective:

NON-DESTRUCTIVE TESTING

Objectives

- To acquire a skill in Non-Destructive Testing.
- To understand the principles of NDT methods.
- To learn the various applications.

Unit I: VISUAL EXAMINATION AND LIQUID PENETRANT TESTING (10 Hours)

Basic principles- The eye- Unaided visual inspection- Optical aids used for visual inspection- Application - Liquid penetrant testing - Physical principles procedure - Penetrant testing materials - Testing methods -Applications and limitations.

Unit II: MAGNETIC PARTICLE TESTING AND EDDY CURRENT TESTING (10 Hours)

Principle of MPT - Magnetizing techniques- Procedure- Equipment- Limitations- Eddy Current Testing principles- Instrumentation Techniques- Applications - Limitations

Unit III: RADIOGRAPHY (10 Hours)

Basic principle - X ray source-production of gamma ray sources-Properties of X rays and gamma rays- Attenuation in specimen effect of radiation on film - radiographic imaging -Inspection techniques - Applications - Limitations - Safety in industrial radiography- Neutron radiography.

Unit IV: ULTRASONIC TESTING (10 Hours)

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: ADVANCED TESTING TECHNIQUES (10 Hours)

Early Observation of Corrosion - corrosion mapping-High Temperature Hydrogen Attack (HTHA)- Detection, Assessment, Evaluation - imaging techniques using Phased-Array and Time-of-Flight Diffraction (TOFD) electromagnetic techniques such as Remote Field Eddy Current (RFEC) for ferrous tube.

Book for study

1. Dr. BaldevRaj, T.Jayakumar and M.Thavasimuthu, Practical Non-Destructive testing, Narosa Publications, 2009.

UNIT	SECTIONS
I	Chapter 2, sec 2 to 2.4 , Chapter3- sections 3.1 to 3.6
II	Chapter 4, Sections 4.1 & 4.6. Chapter 5, Sections 5.1 to 5.7
III	Chapter 6, Sections 6.1 to 6.14
IV	Chapter 7, Sections 7.1 to 7.8.
V	Study Material

Book for reference

1. Nondestructive testing by Hull & John.
2. Study Material prepared by the Department.

———

Sem. III **Hours/Week: 4**
14PPH3202B **Credits: 4**

Core Elective:

FIBER OPTIC COMMUNICATION

Objectives

- To learn the principle of optical fibers.
- To learn the various components of optical fiber communications.
- To understand the theory of transmission and network system.

Unit - I: INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system - Elements of an Optical Fiber Transmission link - Fiber Types - Rays and Modes - Step Indexed Fiber Structure - Graded Index Fiber Structure - Graded Index Numerical Aperture - Fiber losses.

Unit - II: FIBER OPTICAL SOURCES AND COUPLERS

LED - LED materials - Fiber LED Coupling - LASER - Spatial Emission Pattern of LASER - Modulation Response of LASER - Single Frequency LASER - Light Emitting Transistor. Optical Couplers: Types of Optical Couplers - Star Couplers - T Couplers - Source to Fiber Coupling Efficiency - Opto-couplers and applications.

Unit - III: COHERENT OPTICAL FIBER COMMUNICATION SYSTEM

Fundamental Concepts - Homodyne Detection - Heterodyne Detection - Modulation Techniques - Direct detection OOK - OOK Homodyne Detection - PSK Homodyne Detection - Heterodyne Detection Schemes - Polarization Control Requirements.

Unit - IV: ANALOG AND DIGITAL TRANSMISSION SYSTEM

Overview of Analog Links - Multichannel Transmission Techniques - Multichannel Amplitude Modulation - Multichannel Frequency Modulation - Digital Transmission - Line Coding - NRZ codes - RZ Codes - Block Codes.

Unit - V: NETWORK SYSTEMS AND TECHNIQUES

Wavelength Division Multiplexing - Local Area Networks - Optical Fiber Bus - Ring Topology - Star Architectures - Advanced Multiplexing Strategies - Optical TDM - Sub Carrier Multiplexing - WDM Network Architectures.

Book for Study

1. Gerd Keiser, Optical Fiber Communication, McGraw-Hill - 2nd Edition.
2. John Gowar, Optical Communication System, Prentice Hall of India - 2nd Edition.
3. Subir Kumar Sarkar, Optical fiber and fiber optic communication system, S. Chand - 4th Edition (2010).

Reference Book

1. Govind P. Agarwal, Fiber Optic Communication System, John Wiley & Sons (2002).

_____

Sem. III **Hours/Week: 4**
14PPH3402 **Credits: 4**

IDC-3 (BS):

MODERN PHOTOGRAPHY

Objectives

- To make the students know the techniques of exposure, developing and printing.
- To make the students know how to handle digital and video cameras.
- To make the students know how to use Photoshop.
- To edit the digital images and to mix video and audio.

Unit-I: CAMERA, LENSES, DEVELOPING AND PRINTING (10 Hrs)

SLR Camera - Mechanical and Auto - Interchangeable lenses - Telephoto, Wide angle, Zoom and macro lenses - Developing of the film - Tank Development - Printing - Enlarger.

Unit-II: COLOUR AND DIGITAL PHOTOGRAPHY (10 Hrs)

Colour Photography - Light and colour - Filters for colour - The colour quality - Processing of colour films - Digital photography - Digital still camera and their parts - Types of digital camera.

Unit-III: DIGITAL PHOTOGRPAHY - IMAGE, STORING & EXPOSURE TECHNIQUES (10 Hrs)

The CCD chips - storing images - The view finder - Optical and LCD display - Optical / Digital zooms - Composing the picture - focus - Depth of field - exposure - white balance.

Unit-IV: BASIC DIGITAL TECHNIQUES - PHOTOSHOP (10 Hrs)

Introduction to Photoshop - starting to use Editing Software - saving the photos - Cropping - Straightening - Resizing - Brightening and Darkening Photos - Removing Red eye.

Unit-V: VIDEO PHOTOGRAPHY (10 Hrs)

Video camera - Principle of camera tube - Types of camera tubes - Block diagram of a video camera and their parts - Handling operations and precautions for the use of a video camera - Video and Audio mixing using software - PC digital video and its applications.

Books For Study

1. O.P. Sharma - 'Practical Photography', Hind Pocket books (P) Ltd, 1997.
2. Alex May - 'Digital Photography', A Dorling Knidersley book, London, 2002.
3. Doug Harman - The Digital Photography, Hand Book, Quercus Publishing Ltd., USA - 2010.

_____

Sem. IV **Hours/Week: 6**
14PPH4112 **Credits: 6**

NUCLEAR, PARTICLE AND ASTROPHYSICS

Objectives

- To understand the basic structure and properties of the nucleus.
- To know the causes and mechanism of natural radioactivity.
- To differentiate different type of nuclear reactions and to apply this knowledge for producing fission and fusion energy.
- To understand the properties of various fundamental particles, their decay and the interactions. To study the aspects and importance of Astrophysics and Radio astronomy.

Unit I: BASIC PROPERTIES OF NUCLEUS (15 Hrs)

Nuclear mass and binding energy - atomic masses - systematics of nuclear binding energy - nuclear size - charge radius - potential radius - spin and parity - statistics of nucleus - magnetic dipole moment - electric moments - electric quadrupole moments - isospin - nuclear forces - ground state of the deutron - wave equation for the deutron and solution - excited state of deutron - low energy proton neutron scattering - spin dependence of n-p interaction -Nuclear models - liquid model - Bohr Wheeler theory of Fission - Experimental evidence for shell effects - shell Model.

Unit II: NUCLEAR DECAY AND RADIOACTIVITY (15 Hrs)

Theory of alpha disintegration - hindrance and formation factors - fine structure of alpha decay - energetics of beta decay - neutrino hypothesis - Fermi theory of beta decay - selection rules - Sargent diagram - orbital electron capture - parity non conservation - double beta decay - gamma ray spectra and nuclear energy level - radio active transition in nuclei - nuclear isomerism - internal conversion - resonance fluorescence - angular correlation.

Unit III: NUCLEAR REACTIONS (15 Hrs)

Types of nuclear reactions - conservation laws - reaction energetics - Q value - threshold energy - nuclear reaction cross section - level width - compound nuclear theory - Briet Wigner dispersion formula and interpretation (no derivation) - direct reaction - striping and pick up reactions -nuclear fission -energy released in fission - nuclear chain reaction - four factor formula - nuclear reactor - disposal of radio active waste - nuclear fusion - Stellar energy - thermonuclear weapons - trace element analysis - diagnostic nuclear medicine - therapeutic nuclear medicine.

Unit IV: PARTICLE PHYSICS (15 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 - symmetry and conservation laws -special symmetric groups - Gelman Neeman theory - Quark model - SU3 symmetry - unification of fundamental interactions - CPT invariance and applications of symmetry arguments to particle reaction, parity non conservation in week interaction, relativistic kinematics.

Unit V: ASTROPHYSICS AND RADIO ASTRONOMY (15 Hrs)

Physical properties of stars - life cycle of a star - end products of Stellar evolution - structure of milky way - expanding universe - future prospects - Radio astronomy - radio telescopes - Synchrotron radiation - spectral lines in radio astronomy - a few major discoveries in radio astronomy - Radio astronomy in India - Hot big bang cosmology.

Books for Study

1. S.N. Ghoshal, Nuclear Physics, S. Chand and company Ltd. 2003.
2. Satya Prakash, Nuclear Physics and Particle Physics, Sultan Chand and sons, First edition 2005.
3. Joshi A.W, Horizons of Physics, Willey Eastern Ltd.

Unit	Book	Sections
I	1	2.1 – 2.13, 17.2, 17.3, 17.4, 17.6, 17.8, 9.4, 9.5, 14.7, 14.11
II	1	4.9 – 4.12, 5.5 – 5.7, 5.9, 5.10, 5.12, 5.16, 5.18, 6.8 – 6.11, 6.16, 6.19
III	2	8.1, 8.2, 8.4, 8.5, 8.9, 8.10, 8.12, 8.13, 8.15, 9.2, 9.4,9.11,9.12,9.13,9.17, 9.21, 20.1, 20.4, 20.5
IV	2	11.4 – 11.14, 11.16.
V	3	Chapters 14 & 15

Books for Reference

1. Kenneth S. Krane - Introductory Nuclear Physics, John Wiley and Sons, New York, 1988.
2. Joshi A.W - Nuclear Physics, Gujarat Umesh Prahasham.
3. Pandya and Yadav - Nuclear and Particle Physics world, Cambridge University Press.
4. Bernard L. Cohen - Concepts of Nuclear Physics, Tata McGraw Hill Publishing Co., New Delhi.
5. Irwing Kaplan, Nuclear Physics, Addison-Wesley Pub. Company, 2nd edition.

———

Sem. IV **Hours/Week: 6**
14PPH4113 **Credits: 6**

CONDENSED MATTER PHYSICS

Objectives

- Study of crystal structure and imperfections.
- Study on lattice vibration and thermal properties.
- To study the properties and related theories of solids.

Unit-I: Packing of atoms in crystal, diffraction and imperfections in crystals (15 Hrs)

Packing and Close packing of equal spheres in 3 dimensions-classification of close Packing- axial ratio and lattice constants- voids in close packing-size and coordination of voids-significance of voids- X-ray diffraction-Laue equations-interpretation of Bragg's equation- Ewald construction-reciprocal lattice-properties of reciprocal lattice- X-ray diffraction experiment-powder method point imperfections- concentration of point imperfections-line imperfections-surface imperfection.

Unit-II: Thermal properties of Solids (15 Hrs)

Dynamics of chain of identical atoms-dynamics of diatomic linear chain-Fick's first and second law of diffusion-diffusion mechanisms-Kirkendall effect-Debye model for specific heat capacity-thermal conductivity of solids-thermal conductivity due to electrons and phonons-thermal resistance of solids- anharmonicity and thermal expansion.

Unit-III: Conductors and Superconductors (15 Hrs)

Electrical conductivity and ohms law-Wiedemann-Franz -Lorentz law-electrical resisitivity of metals-nearly free electron model-Tight binding approximation-Fermi surface and Brillouin zones-Characteristics of Fermi surfaces-efect of electric field and magnetic field on Fermi surface-experimental study of Fermi surfaces(anomalous skin effect, cyclotron resonance, de Hass-van Alphen effect) - Meissner effect - thermodynamics of superconducting transitionss-origin of energy gap-isotope effect-London equations-London penetration depth-coherence length-BCS theory-Josephson effect.

Unit-IV: Semiconductors and dielectrics (15 Hrs)

Carrier concentration in semiconductors- Fermi level and carrier concentration in semiconductors-mobility of charge carriers - effect of temperature on mobility-electrical conductivity in semiconductors-Hall effect in

semiconductors-Junction properties - Local electric field at an atom- dielectric constant and its measurement-polarizability-classical theory of electronic polarizability - dipolar polarisability- piezo-pyro ferro electric properties of crystals - ferroelectricity.

Unit-V: Magnetic properties of solids (15 Hrs)

Origin of permanent magnetic moments-Langevin's classical theory of diamagnetism and paramagnetism-Quantum theory of paramagnetism-Ferromagnetism - Weiss molecular field- Temperature dependence of spontaneous magnetization-ferromagnetic domain-domain theory-Antiferromagnetism- Ferrimagnetism and ferrites

Book for Study

1. Wahab M.A., Solid state Physics, 2nd edition, Narosa publishing house, India, 2010.

UNITS	BOOK	SECTIONS
I	1	3.2, 3.3 – 3.8, 8.6, 8.7, 8.9 – 8.13, 8.15, 8.16, 5.2, 5.4, 5.12
II	1	6.2, 6.3, 6.6, 6.8, 7.2, 7.3, 7.6, 9.6 – 9.10
III	1	10.11, 10.13, 11.7, 11.8, 12.2, 12.5 – 12.7, 12.9, 17.4 –17.11, 17.13
IV	1	13.2 – 13.8, 14.5 – 14.11
V	1	16.6 – 16.10, 16.12 – 16.14, 16.16 – 16.19

Books for Reference

1. Charles Kittel, Introduction to Solid state Physics, 5th edition, John Wiley and Sons, New Delhi, 2003.
2. J.P. Srivastava, Elements of Solid state physics, Second Edition, Prentice-Hall of India PVT LTD, New Delhi, 2008.

———

Sem. IV **Hours/Week: 8**
14PPH4114 **Credits: 4**

PHYSICS PRACTICALS-IV

Objectives

- To understand various techniques and concepts in Electronics.
- To understand various techniques and concepts in General Physics experiments.
- To develop the skill in handling instruments.

1. AlO Band
2. Microwave - Gunn oscillator
3. Laser IV : Fibre Optics
4. Op-amp: Solving I order Simultaneous Equation
5. Analog to Digital Converter
6. RAM - Construction and Study
7. Design of Synchronous Counter
8. Digital Comparator IC based
9. 555 - Bistable MV, Schmitt Trigger
10. Digital Modulation: ASK, FSK
11. Resistivity by Four Probe Method
12. μP - Programming-III:
13. μP - Programming-IV: Digital Clock
14. μP - Interfacing - IV: Display of Character
15. μP - Interfacing - V: Waveform gen
16. μP - Interfacing - VI: Frequency measurement
17. One shot MV using IC 7421 & TTL clock using digital ICs
18. MC - Programming & Interfacing - III
19. MC - Programming & Interfacing - IV
20. Computer: Numerical Problem - IV
21. MC- Programming with C Simulator - II
22. Electron Spin Resonance Spectrometer.

———

Sem. IV **Hours/Week: 4**
14PPH4203A **Credits: 4**

Core Elective:

NANOSCIENCE AND NANOTECHNOLOGY

Objectives

- To learn the basics of nanamaterials
- To aware of synthesis of nano materials.
- To understand the applications of nano materials.

Unit I:

BACKGROUND AND TYPES OF NANOMATERIALS

Historical perspective of nanomaterials - Scientific revolution - Emergence of Nanotechnology - Challenges in Nanotechnology - Types of nanomaterials - One Dimensional (1D)-Two Dimensional(2D) - Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wire.

Unit II:

SYNTHESIS OF NANO MATERIALS

Ball Milling - Electrodeposition - Spray Pyrolysis - Pulsed Laser Deposition (PLD) - DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE), Sol-Gel Process - Reverse Micelles and Micro emulsions - Chemical Vapor Deposition (CVD)

Unit III:

CHARACTERIZATION OF NANOMATERIALS

X-ray diffraction - Debye-Scherer formula - Electron microscopes: scanning electron microscope (SEM) - transmission electron microscope (TEM); atomic force microscope (AFM) -scanning tunneling microscope (STM) - Working Principle, Instrumentation and Application - Photo luminescence.

Unit IV:

NANOMATERIALS AND THEIR PROPERTIES

Carbon nano Tubes - metals (Au, Ag) - metal oxides (TiO_2, ZnO) - semiconductors (Si, CdS) - ceramics and composites - size dependent properties - mechanical, physical, chemical and thermal properties.

Unit V:

APPLICATIONS OF NANO MATERIALS

Molecular electronics and nanoelectronics - Quantum electronic devices - CNT based transistor and Field Emission Display - Membrane based water purification - drug delivery system - applications of GMR and MEMS.

Books for Study

1. A.G. Brecket, A Hand book on Nanotechnology, 1st Edition 2008, Dominant publishers and distributors, New Delhi.
2. P.K. Sharma, Origin and Development of Nanotechnology, 1st Edition 2008, Vista International Publishing House, New Delhi.
3. K.P. Mathur, Nano Science and Nano Technology,1st Edition 2007, Rajat Publications, New Delhi.

Books for Reference

1. C. N. R. Rao, P. J. Thomas and G.U. Kulkarni, Nanocrystals: Synthesis, Properties and Applications, Springer (2007).
2. Guozhong Gao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Imperial College Press (2004).
3. M. Wilson, K. Kannangara, G Smith, M. Simmons, B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.

———

Sem. IV **Hours/Week: 4**
14PPH4203B **Credits: 4**

Core Elective-3B:

DIGITAL PHOTOGRAPHY

Objectives

- To make the students know features of the Digital Camera.
- To make the students know how to use Photoshop for Basic and Advanced Techniques
- To make the students know how to handle Digital and Video Cameras.
- To make the students know how to mix the Video and Audio.

Unit I: THE DIGITAL CAMERA AND LENSES (10 Hrs)

Digital Camera features - Types of Digital Camera - Memory and Memory Cards; Lenses; Zoom Lenses - Fixed Lenses - Changing Lenses; Computer - getting connected - Software and Printer.

Unit II: PHOTO TECHNIQUES AND IDEAS (10 Hrs)

Composition - Focus - Depth of field - exposure - white Balance; Creative Flash - low light - Portraits and People - Travel - Architecture - Weddings - Sports and Action.

Unit III: BASIC DIGITAL TECHNIQUES - PHOTOSHOP (10 Hrs)

Starting to use Editing Software - Saving the photos - Cropping - Straitening - Resizing - Sharpening - Brightening and Darkening Photos - Removing Red eye.

Unit IV: ADVANCED DIGITAL TECHNIQUES - PHOTOSHOP (10 Hrs)

Colour Management - Adjusting Colours - Controlling Colour and Brightness - Cloning and Healing - Dodge and Burn - Layers - Adding Text with layers - Making Panoramas - Special effects.

Unit V: DIGITAL VIDEOGRAPHY (10 Hrs)

Video Cameras - Colour Video Systems - Types of picture tubes - Block diagram of a Video camera and their parts - Video and Audio mixing using software - Precautions for the use of a Video camera - PC Digital Video and its applications.

Books for Study

1. Doug Harman, The Digital Photography Handbook, Quercus Publishing Ltd., 2010.
2. Arch C. Luther, Using Digital Videos, AP Professional, Cambridge, 1998.

Sem. IV
14PPH4115 **Credits: 2**

COMPREHENSIVE EXAMINATION

Sem. IV **Hours/Week: 6**
14PPH4116 **Credits: 3**

DISSERTATION & VIVA VOCE
