M.Sc. PHYSICS

SYLLABUS : 2012

CHOICE BASED CREDIT SYSTEM (CBCS)

St. JOSEPH'S COLLEGE (Autonomous)

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

College with Potential for Excellence by UGC

TIRUCHIRAPPALLI - 620 002, INDIA.

FEATURES OF CHOICE BASED CREDIT SYSTEM

PG COURSES

The Autonomous (1978) St. Joseph's College, accredited with Five Star status in 2001, Re-accredited with **A⁺ Grade** from **NAAC (2006),** Re-accredited with **A Grade** from **NAAC (3rd cycle)**, had introduced the Choice Based Credit System **(CBCS)** for PG courses from the academic year 2001-2002. As per the guidelines of Tamil Nadu State Council of Higher Education (TANSCHE) and the Bharathidasan University, the College has reformulated the CBCS in 2008-2009 by incorporating the uniqueness and integrity of the college.

OBJECTIVES OF THE CREDIT SYSTEM

- To provide mobility and flexibility for students within and outside the parent department as well as to migrate between institutions
- To provide broad-based education
- To help students learn at their own pace
- To provide students scope for acquiring extra credits
- To impart more job oriented skills to students
- To make any course multi-disciplinary in approach

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 relation between credits and hours.

Sem.	Specification	No. of Papers	Hour	Credit	Total Credits
I – IV	Core Courses (Theory & Practical)	14	6	14 x 5	70
	Project	1	--	1 x 5	05
I – IV	3 – Core Electives 1 – Soft Skill Course (Common) (IDC-1)	3	4	3 x 4	12
	1 – Inter Dept. Courses (IDC-2)	2	4	2 x 4	08
I – IV	SHEPHERD – Extension Activity	~	70	5	05

Total Minimum Credits **100**

Other Additional Credits (Dept. Specific) **....**

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 100 credits. The total number of courses offered by a department is 20. However within their working hours a few departments can offer extra credit courses.

Course Pattern

The Post Graduate degree course consists of three major components. They are Core Course, Elective Course and Inter Departmental Course (IDC). Also 2 compulsory components namely Project / Project related items and SHEPHERD, the extension components are mandatory.

Core Course

A core course is the course offered by the parent department, totally related to the major subject, components like Practicals, Projects, Group Discussions, Viva, Field Visits, Library Record form part of the core course.

Elective Course

The course is also offered by the parent department. The objective is to provide choice and flexibility within the department. The student can choose his/her elective paper. Elective is related to the major subject. The difference between core course and elective course is that there is choice for the student. The department is at liberty to offer three elective courses any semester. It must be offered at least in two different semesters. The staff too may experiment with diverse courses.

Inter Departmental Course (IDC)

IDC is an inter departmental course offered by a department for the students belonging to other departments. The objective is to provide mobility and flexibility outside the parent department. 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. The list is given at the end of the syllabus copies. Two IDC s must be taken by students which are offered in Semester II & III. In

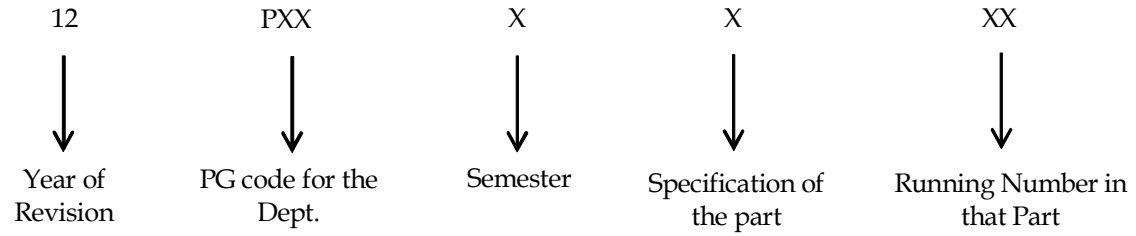
semester II, a common IDC, Soft Skills is to be offered by JASS (Joseph Academy of Soft Skills).

Day College (Shift-I) student may also take an IDC-2 from SFS (Shift-II) course and vice versa

The IDC are of application oriented and inter-disciplinary in nature.

Subject Code Fixation

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



01 – Core Courses: Theory & Practical
02 – Core electives
03 – Additional Core Papers (if any)
04 – Inter Departmental Courses
05 – Project
06 – SHEPHERD

CIA Components

The CIA Components would comprise of two parts: (1) Test Components conducted by Controller of Examination (COE) and (2) Teacher specific component. The two centralized tests will be conducted by the COE (Mid-Semester Test & End-Semester Test) for 30% each administered for 2 hours duration. The remaining 40% would comprise of any three components as listed below and will be carried out by the faculty concerned for that paper.

* Assignment, Quiz (Written / Objective), Snap Test, Viva-Voce, Seminar, Listening Comprehension, Reading Comprehension, Problem Solving, Map Reading, Group Discussion, Panel Discussion, Field Visit, Creative Writing, Open Book Test, Library Record, Case Study, etc.

* As a special consideration, students who publish papers in referred journals would be exempted from one of the teacher specific internal components in one of the papers. At the beginning of each semester, the four internal components would be informed to the students and the staff will administer those components on the date specified and the marks acquired for the same will be forwarded to the Office of COE.

Evaluation

For each course there are formative continuous internal assessment (CIA) and semester examinations (SE) in the weightage ratio 50:50.

Once the marks of CIA and SE for each course are available, the Overall Percentage Mark (OPM) for a student in the programme will be calculated as shown below:

$$OPM = \frac{\sum_i C_i M_i}{\sum_i C_i}$$ where C_i is the credit earned for that course in any semester and M_i is the marks obtained in that course.

The Scheme of Over-all Results is as follows:

	PG	
Class	**Arts (OPM)**	**Science (OPM)**
SECOND	50 to 59.99	50 to 59.99
FIRST	60 to 74.99	60 to 79.99
DISTINCTION	75 & Above	80 & Above

Declaration of Result

Mr./Ms. _____ has successfully completed M.Sc./M.A. degree course in _____. The student's overall average percentage of marks is _____ and has completed the minimum 100 credits. The student has also acquired _____ (if any) additional credits from courses offered by the parent department.

M.Sc. Physics - Course Pattern

SEM	CODE	SUBJECT TITLE	Hrs	CREDIT
1	12PPH1101	Core Paper-1 Classical Mechanics	6	5
	12PPH1102	Core Paper-2 Mathematical Physics	6	5
	12PPH1103	Core Paper-3 Analog and Digital Electronics	6	5
	12PPH1104	Core Paper-4 Physics Practical l	8	5
	12PPH1201A	Core Elective-1 Numerical and Statistical Methods (or)	4	4
	12PPH1201B	Core Elective-1 Medical Physics	(4)	
		Total for Semester 1	**30**	24
2	12PPH2105	Core Paper-5 Quantum Mechanics	6	5
	12PPH2106	Core Paper-6 Electrodynamics and Plasma Physics	6	5
	12PPH2107	Core Paper-7 Microprocessor and Microcontroller	6	5
	12PPH2108	Core Paper-8 Physics Practical II	8	5
	12PSK2401	IDC-I Soft Skills-Common Syllabus	4	4
		Total For Semester 2	**30**	24
3				
	12PPH3109	Core Paper-9 Statistical Mechanics	6	5
	12PPH3110	Core Paper-10 Atomic and Molecular Spectroscopy	6	5
	12PPH3111	Core Paper-11 Physics Practical III	8	5
	12PPH3202A	Core Elective-2 Experimental Techniques and Instrumentation (or)	4	4
	12PPH3202B	Core Elective-2 Fibre Optic Communications	(4)	
	12PPH3402	IDC-II Modern Photography	4	4
		Project Literature Survey	2	
		Total For Semester 3	**30**	23
4	12PPH4112	Core Paper-12 Nuclear, Particle and Astrophysics	6	5
	12PPH4113	Core Paper-13 Condensed Matter Physics	6	5
	12PPH4114	Core Paper-14 Physics Practical-IV	8	5
	12PPH4202A	Core Elective-3 Nano Science and Nano Technology (or)	4	4
	12PPH4202B	Core Elective-3 Digital Photography	(4)	
	12PPH4501	Project & Viva –Voce	6	5
		Total For Semester 4	**30**	24
	12PPH4601	SHEPHERD		5
		Total For All The Semester	**120**	**100**

Semester-1 *Hours/Week: 6*
12PPH1101 *Credit : 5*

CLASSICAL MECHANICS

Objectives

- To understand the fundamental principles of classical mechanics and their applications.

UNIT- I: FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION

Mechanics of a particle and system of particles - conservation laws - 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

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

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

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

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

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

UNITS	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

BOOK 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

Semester-1 *Hours/ Week: 6*

12PPH1102 *Credit : 5*

MATHEMATICAL PHYSICS

Objectives

- To understand various mathematical techniques and concepts.
- 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 C_{2v} and C_{3v} 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 – half range expansion – some typical waveforms — Application of FS in forced vibrations.

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 PDE for heat conduction.

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, (iii) integral of the form $\int F(x)\,dx$.

Books for study

1. Joshi AW – Matrices and Tensors in Physics – New Age Int. Ltd. Pub., N.Delhi, 3/e, 2006.
2. Tinkhan M – Group Theory and Quantum Mechanics – McGraw Hill – New Delhi, 1964.
3. Aruldhas G – Molecular Structure and Spectroscopy – Prentice Hall of India, 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	1.3-1.8, 1.11, 2,12, 5.3 - 5.8, 14.1 – 14.5
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)

Semester-1 *Hours/ Week: 6*

12PPH1103 *Credit : 5*

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, 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.

Semester-1 *Hours/ Week: 4*

12PPH1201A *Credits : 4*

CORE ELECTIVE – 1: NUMERICAL AND STATISTICAL METHODS

Objectives

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

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.
   (for Units IV & V)

Semester-1 *Hours/ Week: 4*
12PPH1201B *Credits : 4*

CORE ELECTIVE – 1: MEDICAL PHYSICS

Objectives

- To acquire knowledge of forces, pressure and the importance of temperature in human body and 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 and 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 AND 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)
3. R.S.Khandhur, 2010, Tata McGraw Hill education private limited.

Semester-2 *Hours/ Week: 6*

12PPH2105 *Credits : 5*

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.

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 L^2– 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 formula – 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 - 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, Macmillam 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.

Semester-2 *Hours/ Week: 6*

12PPH2106 *Credits : 5*

ELECTRODYNAMICS & PLASMA PHYSICS

Objective

- To know the basics of electrostatics and magnetostatics
- To acquire knowledge of wave propagation in different median 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 AND 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	SECTION
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.

Semester-2 *Hours/ Week: 6*

12PPH2107 *Credits : 5*

MICROPROCESSOR AND MICROCONTROLLER

Objectives

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

Unit-IMICROPROCESSOR 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	7.7.1-7.7.4, 8.8, 9.3, 9.5.1, 9.5.3, 9.6.1, 9.8, 9.9
	2	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.

Semester-2 *Hours/Week - 4*
12PSK2401 *Credits - 4*

IDC-I: SOFT SKILLS

Unit 1: Effective Communication & Resume Writing 12 Hours

Effective Communication

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

Resume Writing

What is Resume? Types of Resume? Chronological, Functional and Mixed Resume, Steps in preparation of Resume.

Unit II: Group Discussion, Interview Skills & Team Building 18 hours

Group Discussion (GD)

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 GD.

Interview Skills

Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Team Building

Team Vs Group – synergy, Stages of Team Formation, Dabbawala-Case Study-PPT, Broken Square-Exercise, Group dynamics, Win as much as you win - Exercise, Leadership – Styles, Work ethics.

Unit III: Personality Development, Attitude & Motivation 18 hours

Personality Development

Self awareness, Assertiveness, Goal setting, Problem-solving, Conflict and Stress Management, Decision-making skills, Positive and Creative thinking, Lateral thinking, Time management.

Attitude

Concept, Significance, Factors affecting attitudes, Positive attitude, Advantages, Negative attitude, Disadvantages, Ways to develop positive attitude, Difference between Personalities having positive and negative attitude.

Motivation

Concept of motivation, Significance, Internal and external motives, Importance of self-motivation, Factors leading to demotivation.

Unit IV: Numerical Ability **8 hours**

- 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, Ratios and Proportions.

Unit- V: Test of Reasoning **8 hours**

Verbal Reasoning

- Series Completion, Analogy
- Data Sufficiency, Assertion and Reasoning
- Logical Deduction

Non-Verbal Reasoning

- Series
- Classification

References

* Aggarwal, R.S. *Quantitative Aptitude*, S.Chand & Sons.
* Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*. S.Chand & Co., Revised Edition.
* Alex, K. (2009). *Soft Skills*, New Delhi S. Chand & Company Ltd.

* Covey, Stephen. (2004). *7 Habits of Highly effective people,* Free Press.

* Egan, Gerard. (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.

* Khera, Shiv (2003). *You Can Win*. Macmillan Books , Revised Edition.

* Murphy, Raymond. (1998). *Essential English Grammar*. 2nd ed., Cambridge University Press.

* Prasad, L.M. (2000). *Organizational Behaviour, S.Chand & Sons.*

* Ravindran, G., Elango, S.P.B., Arockiam, L. (2009). *Success through Soft skills*. IFCOT publications

* Sankaran, K. & Kumar, M. *Group Discussion and Public Speaking*. M.I. Pub, Agra, 5th ed., Adams Media.

* Schuller, Robert (2010). *Positive Attitudes*, Jaico Books.

* Thamburaj, Francis (2009). *Communication Soft skills*, Grace Publications.

* Trishna's (2006). *How to do well in GDs & Interviews*, Trishna Knowledge Systems.

** Yate, Martin. (2005). H*iring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester-3 *Hours/ Week: 6*

12PPH3109 *Credits : 5*

STATISTICAL MECHANICS

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 - statistical, thermal, particle equilibrium-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 - theory of imperfect gases - partition function - equation of state and virial coefficients.

Unit - III: Quantum Statistical mechanics (15 Hrs)

Statistical weight - density of matrix - Bose-einstein Statistics - Fermi - Dirac Statistics - Maxwell - Boltzmann - black body radiation and Plancks radiation law - energy and pressure of bose-einstein and fermi - dirac-gas degeneracy - Bose-Einstein condensation-electron gas - free electron model and electronic emission.

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, volume and enthalpy - 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

Book for Study

1. Gupta S.L & Kumar V., Statistical Mechanics, Pragati Prakashan, Meerut, 2004.

UNIT	BOOK	SECTIONS
I	1	A.2-7,1.1,1.1.1,1.3,1.7,1.10-1.13,2.1,3.0.3
II	1	2.7,2.9,2.10,2.12,2.14,2.15-2.17,4,4.1,4.2
III	1	5.9,5.11,6.2,6.3,6.4,6.10,8.0-8.3,9.0,9.3,9.4
IV	1	10.1-10.3,10.5,12.1-12.7,12.10
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, NewDelhi, 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, NewDelhi, 2008.

Semester-3 *Hours/ Week: 6*

12PPH3110 *Credits : 5*

ATOMIC AND MOLECULAR SPECTROCOPY

Objectives

- To acquire the knowledge of interaction in EMR with atoms/ molecules and different types of spectra.
- To acquire basic properties of lasers and their applications in various fields.

Unit - I: ATOMIC SPECTROSCOPY (15 Hrs)

Investigation of spectra - theoretical principles - quantum states of an electron in an atom - Hydrogen atom spectrum - electron spin and stern - Gerlach experiment - spin - orbit coupling - fine structure - spectroscopic terms and selection rules - hyperfine structure - Pauli exclusion principle - Alkali type spectra - LS & JJ coupling - Zeeman effect, Pachen-back effect, Stark effect, X-ray spectra.

Unit - II: MOLECULAR SPECTRA (15 Hrs)

Molecular energy states - classifiction of energies & molecules with examples - rotation spectra - Stark effect - determination of dipole moment of linear and symmetric molecules - IR spectra-rotation - vibration spectra of linear and symmetric molecules - Raman effect - experimental techniques of Raman spectroscopy - classical polarizability and quantum theory of Raman effect - rotational, vibrational and rotational - vibrational Raman spectra of diatomic molecules - application of Raman spectroscopy.

Unit - III: ELECTRONIC SPECTRA (15 Hrs)

Molecular quantum number - coupling of angular momenta - selection rules - prism and grating instruments - grating mountings - electronic excitation of diatomic molecules - vibrational analysis of band system - Deslandre's table - construction and application - intensity distribution of electronic bands - rotational structure of electronic bands - Fortrat parabola and band head formation - intensity distribution within a band.

Unit - IV: RESONANCE SPECTRA (15 Hrs)

NMR spectroscopy - experimental technique - analysis of resolution of NMR spectra - chemical shift. NQR - requirement and general principles - experimental techniques and application - ESR - relaxation phenomena - experimental methods - ESR spectrum. Mossbauer spectroscopy - isomer shift - nuclear quardrupole splitting - Zeeman splitting-applications.

Unit - V:LASER DEVICES AND THEIR APPLICATIONS (15 Hrs)

Principles of Lasers - pumping - He-Ne laser - CO_2 Laser-semiconductor laser - Holography - recording and reconstruction - applications of Holography - Laser induced fusion - fusion process - Laser energy requirements - Laser induced fusion reactor - stimulated Raman Scattering - Laser in isotope separation - lidar - Laser tracking - Lasers in industry and medicine.

Books for study

1. Elements of spectroscopy, S.L. Gupta, V. Kumar & R.C. Sharma, Pragati Pragasan, 9th Edition, 2006.
2. Straughan, B.P. and Walker, S., Spectroscopy, Vol. 2, London: Chapman and hall, 1996.
3. Straughan, B.P. and Waler, S., Spectroscopy, Vol. 3, London: Chapman and hall, 1996.
4. Straughan, B.P. and Walker, S., Spectroscopy, Vol. 1, London: Chapman and hall, 1996.
5. Laud, B.B., Lasers and Nonlinear Optics, New Age Intl. Ltd., 2004.

UNIT	BOOK	SECTIONS
I	1	1.1, 1.2, 1.3, 1.4.1, 2.4, 2.5, 2.6, 7.6, 5.1, 6.10, 6.13, 9.1, 9.5, 9.11
II	2	4.1, 4.2.1-4.2.6, 4.2.10, 4.2.11, 4.4, 4.5.1-4.5.2, 4.6, 4.7, 4.7.1, 4.7.2, 4.10-4.16
III	3	2.1.1-2.1.4, 2.2.1-2.2.3, 2.5, 3.1, 3.1.1, 3.2, 3.3, 3.3.1, 3.3.4, 4.1, 4.1.1, 4.1.2, 4.2, 4.3, 5.1, 5.1.1, 5.1.2, 5.2, 5.3, 5.3.1-5.3.3
IV	4	2.1.1-2.1.4, 2.2.1-2.2.3, 2.5, 3.1, 3.1.1, 3.2, 3.3, 3.3.1, 3.3.4, 4.1, 4.1.1, 4.1.2, 4.2, 4.3, 5.1, 5.1.1, 5.1.2, 5.2, 5.3, 5.3.1, 5.3.2, 5.3.3
V	5	6.1, 6.2, 8.1, 8.5.1, 9.1, 9.2, 9.3, 9.4, 12.1, 12.4, 15.2, 17.5, 17.11, 17.14, 17.15

Book for Reference

1. Banwell, Molecular Spectroscopy, New Delhi: Tata McGraw Hill, 1994.

Semester – 3 *Hours/Week: 4*

12PPH3202A *Credits : 4*

ELECTIVE-II: EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION

Objectives

- To understand the experimental data analysis and to know the instrumentation techniques.

Unit - I: ERRORS IN INSTRUMENTATION (10 Hrs)

Types of errors – systematic and random errors – accuracy and precision – significant figures and round off – uncertainties and probable error – random variable – mean, variance and standard deviation.

Unit - II: DATA ANALYSIS (10 Hrs)

Normal distribution – sampling techniques – propagation of errors – estimates of mean and errors - instrumental uncertainties – statistical fluctuations – Chi square test – goodness of fit.

Unit - III: GENERAL MEASUREMENT AND SIGNAL PROCESSING (10 Hrs)

Measurement of: (i) time and energy (ii) fundamental constants e, h, c (iii) high and low resistances, L and C.Q-meter – use of signals from detectors - Instrumentation. I / O devices – analog displays and recorders, digital devices.

Unit - IV: MATERIALS CHARACTERIZATION (10 Hrs)

Structural analysis – single crystal XRD, microhardness, conductivity, impedance analysis – LCR bridge – optical –FTIR-UV-absorbance-transmittance-reflectance.

Unit - V: SENSORS AND TRANSDUCERS (10 Hrs)

Inductive, capacitive and resistive transducers, load cell, LVDT, potentiometric, moderate low, high pressure sensors, thermistior, RTD, LDR, solar cell, photodiode, hall probe – piezoelectric, flow sensors.

Books for study

1. B.C. Nakra and K.K. Chaudry – Instrumentaion Measurement and Analysis – Tata McGraw Hill, New Delhi.
2. A.K. Sawhney – A Course in Electrical and Electronic Measurements and Instruments.
3. Willard et al. – Instrumentation method and Analysis.

Semester-3 *Hours/ Week: 4*

12PPH3202B *Credits : 4*

CORE ELECTIVE – 2: FIBER-OPTIC COMMUNICATIONS

Objectives

- To acquire knowledge about the principles and technology of optical communication systems
- To learn the design of a point-to-point optical communications link, including power, noise and risetime/jitter budgets

UNIT - I: Basic Concepts (10 Hrs)

Analog and Digital Signals - Channel Multiplexing - Modulation Formats - Optical Communication Systems - Lightwave System Components - Optical Fibers as a Communication Channel - Optical Transmitters - Optical Receivers

UNIT - II: Optical Fibers (10 Hrs)

Geometrical-Optics Description - Step-Index Fibers - Graded-Index Fibers - Wave Propagation - Maxwell's Equations - Fiber Modes - Single - Mode Fibers - Dispersion in Single - Mode Fibers - Group - Velocity Dispersion - Material Dispersion - Waveguide Dispersion - Higher - Order Dispersion - Polarization - Mode Dispersion - Dispersion - Induced Limitations - Fiber Manufacturing: Design Issues - Fabrication Methods - Cables and Connectors.

UNIT - III: Coherent Lightwave Systems (10 Hrs)

Local Oscillator - Homodyne Detection - Heterodyne Detection - Signal-to-Noise Ratio - Modulation Formats - ASK Format - PSK Format - FSK Format - Demodulation Schemes - Synchronous ASK Receivers - Asynchronous ASK Receivers - Asynchronous DPSK Receivers - Sensitivity Degradation - Phase Noise - Intensity Noise - Polarization Mismatch - Fiber Dispersion.

UNIT - IV: Optical Amplifiers (10 Hrs)

Gain Spectrum and Bandwidth - Gain Saturation - Amplifier Noise - Amplifier - Semiconductor Optical Amplifiers - Amplifier

Design - Amplifier Characteristics - Pulse Amplification - Amplifier Performance - Applications.

UNIT - V: Multichannel Systems (10 Hrs)

WDM Lightwave Systems - High-Capacity Point-to-Point Links - Wide-Area and Metro-Area Networks - Multiple-Access WDM Networks - Time-Division Multiplexing - Channel Multiplexing - Channel De-multiplexing - System Performance - Subcarrier Multiplexing - Analog SCM Systems - Digital SCM Systems - Multi-wavelength SCM Systems - Code-Division Multiplexing - Spectral Encoding.

Book for Study

Fiber-Optic Communication Systems, 3rd Edition, by Govind P. Agrawal (Wiley),

Books for Reference

1. Optics, 4th Edition, by Eugene Hecht (Addison-Wesley).
2. Fiber-Optic Communications Technology, by Djafar K. Mynbaev and Lowell L. Scheiner (Prentice-Hall).
3. Fiber Optic Communications, 4th Edition, by Joseph C. Palais (Prentice Hall).

Semester-3 *Hours/ Week: 4*

12PPH3402 *Credits : 4*

IDC – II: 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 AND 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.

Semester-4 *Hours/ Week: 6*

12PPH4112 *Credits : 5*

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 drop 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 - partial wave analysis – level width – compound nuclear theory – Briet Wigner dispersion formula – 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 interaction , C, P and T invariance and applications of symmetry arguments to particle reaction, parity non conservation in weak 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 – historical developments – Synchrotron radiation – spectral lines in radio astronomy – a few major discoveries in radio astronomy – Radio astronomy in India – hot big bang cosmology – recent developments.

Books for Study

1. S.N. Ghoshal, Nuclear Physics, S. Chand and company Ltd. 2003.
2. Satya Prakash, Nulcear 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, 8.16, 9.2, 9.4, 9.11, 9.12, 9.13, 9.17, 9.21, 20.1, 20.4, 20.5
IV	2	11.4 – 11.16
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.

Semester-4 *Hours/ Week: 6*

12PPH4113 *Credits : 5*

CONDENSED MATTER PHYSICS

Objectives

- Study of crystal structure and imperfections
- Study of lattice vibration and thermal properties
- Study of the properties and related theories of solids

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

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	SECTIONS
Unit - I	3.2, 3.3 – 3.8, 5.2 - 5.4, 5.12, 8.6, 8.7, 8.9 – 8.13, 8.15, 8.16
Unit – II	6.2, 6.3, 6.6, 6.8, 7.2, 7.3, 7.6, 9.6 – 9.10
Unit – III	10.11, 10.12, 10.13, 11.7, 11.8, 12.2, 12.5 – 12.7, 12.9, 17.4 – 17.11, 17.13
Unit – IV	13.2 – 13.8, 14.5 – 14.11
Unit – V	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.

Semester-4 *Hours/ Week: 4*

12PPH4202A *Credits : 4*

CORE ELECTIVE – 3: NANOSCIENCE AND NANOTECHNOLOGY

Objectives

- To acquire knowledge about the emerging field of nano science and nano technology.

UNIT I: BACKGROUND AND TYPES OF NANOMATERIALS (10 Hrs)

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 (10 Hrs)

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 (10 Hrs)

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 - Photoluminescence (PL) Spectroscopy.

UNIT IV: NANOMATERIALS AND THEIR PROPERTIES(10 Hrs)

Carbon Nanotubes (CNT) - metals (Au, Ag) - metal oxides (TiO_2, CeO_2, ZnO) - semiconductors (Si, Ge, CdS, ZnSe) - ceramics and composites - size dependent properties - mechanical, physical, thermal and chemical properties.

UNIT V: APPLICATIONS OF NANOMATERIALS (10 Hrs)

Molecular electronics and nanoelectronics – single electron devices - CNT based transistor and Field Emission Display - membrane based water purification – drug delivery system - nanobiotechnology.

Book for Study

Study material prepared by the Department

Books for Reference

1. A Hand book on Nanotechnology – A.G. Brecket, 1st Edition 2008, Dominant publishers and distributors, New Delhi.
2. Origin and Development of Nanotechnology – P.K. Sharma, 1st Edition 2008, Vista International Publishing House, New Delhi.
3. Nano Science and Nano Technology – K.P. Mathur, 1st Edition 2007, Rajat Publications, New Delhi.
4. Nanocrystals: Synthesis, Properties and Applications, C.N.R.Rao, P.J. Thomas and G.U. Kulkarni, Springer (2007).
5. Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Guozhong Gao, Imperial College Press (2004).

Semester-4 *Hours/ Week: 4*

12PPH4202B *Credits : 4*

CORE ELECTIVE – 3: 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. The Digital Photography Handbook – Doug Harman, Quercus Publishing Ltd., 2010.
2. Using Digital Videos, Arch C. Luther, AP Professional, Cambridge, 1998.

PRACTICAL

S. No.	SEMESTER – I	Expt. No.
1	Absorption Spectrum of Iodine	1.5
2	χ - Quincke's method	1.21
3	e/m Magnetron and ϕ - Work function	1.16,1.17
4	Dielectric Constant Study – Solid, Liquid, Wave meter and Lecher wire	1.25,1.24
5	Hall effect in semiconductor	1.26
6	Elastic Constants – Elliptic fringes	1.9
7	Laser – I :Diameter of wire, diffraction	1.13
8	Planck's constant & Photo sensitive devices	1.14 ….
9	Ultrasonic interferometer	1.22
10	BJT Amplifier design	2.4
11	UJT – Characteristics and Applications	2.3
12	Regulated PS – Zener and IC	2.8,2.9
13	K- map simplification – implementation basic and universal gates by SOP & POS	3.1
14	Encoder and Decoder	3.2
15	ALU and Scalar	3.4,3.9
16	555 – Astable and its applications	5.1
17	Op-amp: Basic circuit design	4.2
18	Op-amp: I to V, V to I and Square wave	4.3
19	Wien's Bridge Oscillator : Op-amp	…..
20	Computer: Numerical Problem - I	…..
	SEMESTER - II	
1	Spectrum Photo – Cu / Fe Arc Spectrum	1.1
2	χ - Guoy's method	1.20
3	Michelson Interferometer	1.6
4	Biprism – Optic bench	1.11
5	Energy Gap study of a semiconductor	2.1
6	Elastic Constants – Hyperbolic fringes	1.10
7	Laser – II : Wave length of He-Ne, thickness	…..
8	e – Millikan's oil drop method	1.19
9	Ultrasonic diffraction	1.23
10	FET Amplifier design	2.5
11	SCR – Characteristics and Applications	2.2
12	Transmission Line Characteristics	6.1
13	Parity Checker / Generator & Comparator by gates	….
14	BCD Adder and Subtractor	3.5
15	Shift Registers using Flip-Flop & ICs	3.8
16	555 – Monostable and its applications	5.2
17	Op-amp: Parameters calculation	4.1
18	Op-amp : Low &High and band pass Filters	4.5
19	Phase Shift Oscillator : Op-amp	….
20	Computer: Numerical Problem – II	….

S. No.	SEMESTER – III	Expt. No.
1	e/m Zeeman effect	1.15
2	Microwave – Klystron	6.3
3	Laser III:Refractive index,Brewster's ang	…..
4	Multiplexer and Demultiplexer	3.3
5	Digital to Analog Converters	4.6
6	ROM – Construction and Study	3.10
7	Design of Asynchronous Counter	3.6
8	Power Amplifier : Transistor & IC	2.6,2.7
9	DIAC ,TRIAC – Characteristics & Application	…..
10	Mod & Demod: PAM,PPM,PWM	6.4
11	Geiger Muller Counter	……
12	µP – Programming- I :	7.3
13	µP – Programming –II:	7.4
14	µP – Interfacing – I : Traffic controller	7.6
15	µP – Interfacing – II: Stepper Motor	7.11
16	µP – Interfacing –III: Voltage / Temperature measurement	…..
17	Multiplexed display	…..
18	MC – Programming & Interfacing – I	…..
19	MC – Programming & Interfacing – II	….
20	Computer: Numerical Problem – III	……
21	MC- Programming with C Simulator - I	……
	SEMESTER – IV	
1	AlO Band	1.2
2	Microwave – Gunn oscillator	6.2
3	Laser IV : Fibre Optics	6.6
4	Op-amp: Solving I order Simultaneous Equation	4.4
5	Analog to Digital Converter	4.8
6	RAM – Construction and Study	3.11
7	Design of Synchronous Counter	3.7
8	Digital Comparator IC based	3.12
9	555 – Bistable MV, Schmitt Trigger	5.3,5.4
10	Digital Modulation: ASK, FSK	6.5
11	Resistivity by Four Probe Method	…..
12	µP – Programming-III:	7.5
13	µP – Programming-IV: Digital Clock	7.13
14	µP – Interfacing – IV: Display of Character	7.7
15	µP – Interfacing - V: Waveform gen	7.8
16	µP – Interfacing – VI: Frequency measurement	…..
17	One shot MV using IC 7421 & TTL clock using digital ICs	2.15
18	MC – Programming & Interfacing - III	….
19	MC – Programming & Interfacing - IV	….
20	Computer: Numerical Problem - IV	…..
21	MC- Programming with C Simulator - II	…..

INTER DEPARTMENTAL COURSE – IDC

BIOCHEMISTRY

12PSK2401 SOFT SKILLS

12PBI3402 FIRST AID MANAGEMENT

BIOTECHNOLOGY

12PSK2401 SOFT SKILLS

12PBT3402 APPLIED BIOTECHNOLOGY

BOTANY

12PSK2401 SOFT SKILLS

12PBO3402 HORTICULTURE & LANDSCAPING

CHEMISTRY

12PSK2401 SOFT SKILLS

12PCH3402 HEALTH CHEMISTRY

COMMERCE

12PSK2401 SOFT SKILLS

12PCO3402 FINANCIAL ACCOUNTING FOR MANAGERS

COMMERCE (CA)

12PSK2401 SOFT SKILLS

12PCC3402 CAREER PLANNING AND MANAGEMENT

COMPUTER APPLICATIONS

12PSK2401 SOFT SKILLS

12PCA3402 COMPUTER APPLICATIONS FOR SOCIAL SCIENCES

12PCA3403 FUNDAMENTALS OF PROGRAMMING

COMPUTER SCIENCE

12PSK2401 SOFT SKILLS

12PCS3402A FLASH

12PCS3402B WEB DESIGN

ECONOMICS

12PSK2401	SOFT SKILLS
12PEC3402	INDIAN ECONOMY

ELECTRONICS

12PSK2401	SOFT SKILLS
12PEL3402	COMPUTER HARDWARE

ENGLISH

12PSK2401	SOFT SKILLS
12PEN3402	ENGLISH FOR MEDIA STUDIES

HISTORY

12PSK2401	SOFT SKILLS
12PHI3402	INDIAN CONSTITUTION

HUMAN RESOURCE MANAGEMENT

12PSK2401	SOFT SKILLS
12PHR3402	FUNDAMENTALS OF HRM

INFORMATION TECHNOLOGY

12PSK2401	SOFT SKILLS
12PIT3402A	FLASH
12PIT3402B	WEB DESIGN

MATHEMATICS

12PSK2401	SOFT SKILLS
12PMA3402	OPERATIONS RESEARCH

PHYSICS

12PSK2401	SOFT SKILLS
12PPH3402	MODERN PHOTOGRAPHY

TAMIL

12PSK2401	நுண்வகைமைத்திறன்கள்
12PTA3402	அரசுப்பணித்தேர்வுத் தமிழ் - I