M. Sc.
PHYSICS

SYLLABUS (2007-2010)

under
CHOICE BASED CREDIT SYSTEM
(CBCS)

ST. JOSEPH'S COLLEGE (AUTONOMOUS)
(Nationally Reaccredited with A+ Grade/
College with Potential for Excellence)
TIRUCHIRAPPALLI - 620 002

FEATURES OF CHOICE BASED CREDIT SYSTEM (PG COURSES)

The Autonomous St. Joseph's College (1978) Reaccredited with A+ Grade from NAAC (2007) has introduced the choice based credit system (CBCS) for UG and PG courses from the academic year 2001-2002.

OBJECTIVES of Credit System:

* To provide mobility and flexibility for students within and outside the parent department
* 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. However, there could be some flexibility because of practicals, field visits and tutorials. The following Table shows the relation between credits and hours.

Hours in a week	Hours (2-3)	Hours (4)	Hours (5-6)
Theory Credits	1	3	4
Practicals Credits	1	2	3

For PG courses (2 years) a student must earn a minimum of 100 credits. For MCA course (3 years) the student must earn 140 credits to get a pass. For a two year PG degree course the minimum number of papers offered by a department is 18.

COURSE PATTERN

The Postgraduate degree course consists of three major components. They are Core Course, Optional Course and Extra Department Course (EDC).

Core Course

A core course is the course offered by the parent department, totally related to the major subject, components like Practicals, Projects, Group Discussion, Viva, Field Visit, Library record form part of the core course. All the students of the course must take the core courses.

Optional Course

The optional 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 optional. The optional is related to the major subject. The difference between core course and optional course is that there is choice for the student. The department is at liberty to offer optional course every semester or in any two semesters. It must be offered at least in two semesters. The staff too may experiment with diverse courses.

Extra Department Course (EDC)

EDC is an interdepartmental 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 EDCs must be taken by students.

Day College student may also take an EDC from PG SFS Course and *vice versa.* This provision enables students to earn extra credits. The EDCs are offered in the II and III semesters. For the day college student it is offered in the last hour and for the PG SFS course students in the first hour or zero hour. The EDCs are expected to be application oriented and inter-disciplinary.

For Two Year Degree Programme

	Credits	
Core	- 84	
Optionals	- 8	(2 semesters)
EDC	- 6	
Shepherd	- 2	
Total	- 100	

For Three Year MCA Programme

	Credits	
Core	- 121	
Optionals	- 8	(2 semesters)
EDC	- 9	
Shepherd	- 2	
Total	- 140	

Credit System Codes:
The various papers in the different courses are coded. The following code system is adopted.
Each code indicates the following particulars

1) The year of introduction/revision of syllabus (07)
2) Whether it is undergraduate or postgraduate course (U or P)
3) The discipline's name is indicated by two letters as shown below:

Sl. No.	Course	Subject Code
1.	Biochemistry	BI
2.	Biotechnology	BT
3.	Business Administration	BU
4.	Chemistry	CH
5.	Commerce	CO
6.	Computer Applications	CA
7.	Computer Science	CS
8.	Economics	EC
9.	English	EN
10.	English - General	GE
11.	Electronics	EL
12.	Foundation Course	FC
13.	French	FR
14.	Hindi	HI
15.	History	HS
16.	Human Resource Management	HR
17.	Information Technology	IT
18.	Mathematics	MA
19.	Physics	PH
20.	Plant Biology & Plant Biotechnology	PB
21.	Personnel Management & Industrial Relations	PM
22.	Sanskrit	SA
23.	Statistics	ST
24.	Tamil	TA
25.	Tamil - General	GT
26.	Transport Management	TM
27.	Journalism (EDC)	JO
28.	Law (EDC)	LA
29.	Short Hand (English) (EDC)	SH

4) The semester number (1 or 2 or 3 or 4 for 2-year course)
5) The paper number: The courses in the discipline fall into three categories
   Core papers-numbers : 20 to 39
   Optional papers - numbers : 41 to 49
   EDC's : 61 to 70
   For MCA course offered by Department of Computer Science, the following paper numbers used:
   Core papers : 51 to 80
   Optional Papers : 81 to 90

The following examples illustrate the above concept.
The first semester Core papers in Chemistry is given the code 07PCH121
The EDC offered by Chemistry department in Semester III is given the code 07PCH362

Evaluation:
For each course there is formative continuous internal assessment (CIA) and semester examinations (SE) in the weightage ratio 50:50. The following table illustrates how one evaluates the Overall Percentage Marks (OPM) for a student in Chemistry PG course in the all papers put together
OPM= $(a_1b_1+a_2b_2+ .. a_{23}b_{23}) / (b_1+b_2+ \ldots + b_{23})$
Where a_1 ,a_2 ... a_{23} indicate the marks obtained in the 4 semesters for 23 papers and b_1 ,b_2 … b_{23} indicate the corresponding credits for the 23 courses.
For example if total credit points in 23 papers is 6860 then the OPM is given by
OPM = 6860/total number of credits = 6860.0/98=70.0

If OPM is between 50 and 60, the student gets II class. If OPM is 60 and more, then the student is placed in I class. If the OPM score is 75 and more the student gets first class with distinction.
The performance in shepherd programme is indicated by a pass and is not taken into account for computing OPM.

Declaration of result

———————— has successfully completed M. Sc. degree course with FIRST CLASS. The student's overall average percentage of marks is 70. The student has acquired 2 more credits in SHEPHERD programme.

M. Sc. - PHYSICS - COURSE PATTERN

Sem	Code	Title of the paper	Hrs	Cr
I	07PPH121	Classical Dynamics	7	6
	07PPH122	Mathematical Physics – I	7	6
	07PPH123	Analog and Digital Electronics	6	6
		Physics Practical – I * (G)	4	-
		Physics Practical – II * (E)	4	
		Library	2	
		Total for Semester I	**30**	**18**
II	07PPH224	Applied Electromagnetics	6	6
	07PPH225	Mathematical Physics – II	6	6
	07PPH226	Quantum Mechanics	6	6
	07PPH227	Physics Practical – I (G)	4	5
	07PPH228	Physics Practical – II (E)	4	5
	*	EDC	4	3
		Total for Semester II	**30**	**31**
III	07PPH329	Spectral Physics and Photonics	6	6
	07PPH330	Microprocessor and Microcontroller	6	6
	07PPH331	Statistical Mechanics and Plasma Physics	6	6
		Physics Practical – III*	4	-
		Project*	4	-
	*	EDC	4	3
		Total for Semester III	**30**	**21**
IV	07PPH432	Condensed Matter Physics	6	6
	07PPH433	Nuclear, Particle and Astrophysics	6	6
	07PPH434	Communication Physics	6	6
	07PPH435	Physics Practical – III	4	5
	07PPH436	Project	8	5
		Total for Semester III	**30**	**28**
I-IV		SHEPHERD		2
		Total for all Semesters	**120**	**100**

* Exam at the end of the II and IV semesters.

Sem.I Hours/Week : 7
07PPH121 Credits : 6

CLASSICAL DYNAMICS

Objectives:

- To understand the fundamental principles of Lagrangian methods and central force fields
- To acquire skill in Hamiltonian formulation
- To know rigid body dynamics, oscillatory motion and relativistic concepts

Unit I :

FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION

Mechanics of a particle and system of particles – Conservation laws – constraints – Generalised 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

Reduction to the equivalent one body problem - Equations of motion and first integrals – Equivalent one dimensional problem and classification of orbits – The differential equation for the orbit and integral power law potentials - Kepler problem – Inverse square law of force - Laplace Runge-Lanz Vector –Scattering in a central force field.

Unit III :

HAMILTON'S FORMULATION

Hamilton's equations from variational principle – Principle of least action – Application – canonical transformations – Lagrange and Poisson brackets – Equation of motion and conservation theorems in Poisson brackets - Hamilton – Jacobi method – Action angle variables – Kepler problem in action – angle variables - Lagrangian and Hamiltonian formulation of relativistic mechanics.

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 – Frequencies of free vibration and normal coordinates – Linear triatomic molecule.

Unit V :

NON-LINEAR DYNAMICS

Origin and generation of non linear problems – non linear maps – formulation of non linear first order and second order differential equations – qualitative methods of solving these equations – applications in dynamics, optics, communications – Ricatti equation – Korteweg de Vries (KdV) equations – solitons – applications.

Book For Study

1. Herbert Goldstein - Classical Mechanics, Narosa Publication House, New Delhi, 2nd edition, 10th reprint 2005.

Unit	Book	Sections
I	1	1.1, -1.4, 1.6, 2.1, 2.3, 2.6.
II	1	3.1-3.3, 3.5, 3.7, 3.9,3.10
III	1	8.5, 8.6, 9.1, 9.5, 9.6, 10.1, 10.6, 10.7, 10.8
IV	1	4.4, 5.1, 5.5 – 5.7, 6.1- 6.4
V	4	Study material

Books For Reference :

1. Rana, N.C. and Joag, P.S. - Classical Mechanics, Tata McGraw Hill, New Delhi, 1998.
2. V.B.Bhatia – Classical Mechanics, Narosa pub.Ltd., New Delhi, 1997.

Sem.I Hours/Week : 7
07PPH122 Credits : 6

MATHEMATICAL PHYSICS – I

Objectives :

- To understand the various advanced mathematical techniques and concepts.
- To apply the techniques learnt to physical system and appreciate the importance of mathematics to learn Physics.

Unit I : COMPLEX VARIABLES

Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Residues and singularities – Evaluation of residues – Cauchy's residue theorem – Residue at infinity – Lioville's theorem – Evaluation of definite integrals – Jordan Lemma.

Unit II : LINEAR VECTOR SPACES AND MATRIX THEORY

Vector Spaces: Linear independence of vectors – vector space of n-tuplets – inner product space – Schmitt's orthoganalisation method – Schwartz inequality – linear transformations. Matrix Theory: Review of basic concepts – Bilinear and quadratic forms – functions of a matrix – Kronecker sum and product of matrices – Dirac and Pauli matrices.

Unit III : SPECIAL FUNCTIONS

Legendre differential equation and series solution – Rodrigue formula – generating function – orthonormality – Recurrence relations – Hermite differential equation and series solution - generating function – Bessel differential equation and series solution – Recurrence relations.

Unit IV : CALCULUS OF FINITE DIFFERENCES AND LEAST SQUARE METHOD

Fundamental operators of the calculus of finite differences – Algebra of operators – Fundamental equations satisfied by operators – Difference tables – Gregory-Newton interpolation formula – Derivative of tabulated function – Summation formula – Difference equation with constant coefficient – method of least squares.

Unit V : GROUP THEORY

Definition and nomenclature – Rearrangement theorem – cyclic groups – subgroups and cosets – conjugate elements and class structure – identification of symmetry element and operations – molecular point groups – matrix representation of symmetry operations – Schur's lemmas and the Great Orthogonality Theorem – character of a representation – character table – Generating symmetry operators – construction of character tables - irreducible representation for C_{2v} , C_{3v} and C_s groups – symmetry species specification.

Books For Study :

1. Pipes, L.A & Harvill, L. R,Applied Mathematics for Engineers and Physicists, McGraw Hill Company, New Delhi, New edition
2. Joshi, A.W - Matrices and Tensors in Physics, Wiley Eastern Ltd., 1995.
3. Bell, W & Van Dale - Special functions for Engineers and Scientists, Nostrand Company Ltd., 1969.

Unit	Book	Chapters	Sections
I	1	I	Ch.I – 1-16
II	2	I, XI, XII, XIII, XIV	All
III	3	I	1,2
		II	4
		III	1-7
		IV	1,2,3,4
		V	1,2,6
IV	1	7	1-10
		14	14 - 2
V	1	7.2, 7.3, 7.4, 7.5, 7.6, 7.9 , 8.4.	

Books For Reference :

1. Charlie Harper,Introduction to Mathematical Physics, Prentice Hall of India, New Delhi, 1978.
2. Rajput, B.S , Mathematical Physics, Pragati Prakashan, 1989.
3. John Mathews, Mathematical Methods of Physics, World Students Series edition, 1973.
4. Green Berg, M.D, Advanced Engineering Mathematics, Prentice Hall International, London ,1988.
5. Erwin Kreyazic, Advanced Engineering Mathematics, Wiley and Co., 1969.
6. Relevant Books of Schaum Series.

Sem.I Hours/Week : 6
07PPH123 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

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

Unit II :

OP-AMP APPLICATIONS AND VOLTAGE REGULATION

741 op-amp, Instrumentation amplifier, V to I and I to V converter, sample and hold circuit, comparator, square wave generator, sine wave generators - Series op-amp regulator, IC voltage regulators, 723 general purpose Regulator, Switching Regulator.

Unit III :

DAC, ADC AND TIMER IC

Basic DAC Techniques – Weighted Resistor DAC – R-2R ladder DAC – A/D converters – Parallel comparator ADC – The counter type ADC – Successive approximation converter – Dual slope ADC - 555 Timer – Description of functional diagram – Monostable operation – applications in Monostable mode – Astable operation – applications in Astable mode.

Unit IV :

COMBINATIONAL AND ARITHMETIC LOGIC CIRCUITS

Four variable Karnaugh Map-Combination logic circuit design, Quine McCluskey's tabular method, Decoders, Encoders, Multiplexer, Demultiplexer. 2's complements adder / subtractor, one digit BCD adder and subtractor, serial and parallel adder units, binary multiplication, ALU.

Unit V :

SYNCHRONOUS COUNTERS, MEMORY DEVICES AND DIGITAL EQUIPMENTS

TTL and CMOS clock oscillators, Synchronous counter ICs, Design of synchronous counters, Lockout, MSI counter IC 7490 A, Ring counter and Johnson counter. ROM, Memory organization, Memory expansion, Application of ROMs, PROM, EPROM, RAM, DRAM. Digital building blocks, Digital voltmeters, Frequency counter, period counter, Digital clock.

Books for Study :

1. David A. Bell, Electronic devices and circuits, 3rd edn, Prentice Hall of India, New Delhi 1999.
2. Roy Choudhury, D and Shall Jain, Linear Integrated Circuits, Wiley Eastern Ltd., New Delhi, 2005.
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, 19.9, 20.3
II	2	2.5.2,4.3,4.5,4.7,5.2,5.4,5.7,6.2-6.5
III	2	10.2, 10.2.1, 10.2.2, 10.2.5, 10.3, 10.3.1, 10.3.2, 10.3.4, 10.3.6, 10.4, 8.1- 8.3. 8.3.1, 8.4, 8.4.1, 8.5
IV	3	7.8,7.9,10.2,10.6,10.7, 10.7.1, 10.7.2, 10.8, 10.8.1, 13.16, 13.18-13.22
V	3	9.2 (only TTL and CMOS),12.8, 12.2-12.14, 12.16, 12.17, 14.2, 14.3, 14.5- 4.9, 14.12, 14.16, 14.17 and Chapter 16.

Sem.II Hours/Week : 6
07PPH224 Credits : 6

APPLIED ELECTROMAGNETICS

Objective :

- 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 analog of EM wave with transmission line.
- To understand the optics of EM field.
- To understand the modes of propagation of guided waves and propagation through wave guides .
- To understand working of microwave devices, performance of antennas and characteristics of EM waves.

Unit I : BASIC APPLIED ELECTROMAGNETIC WAVES AND POWER FLOW

Maxwell's equations – derivations and interpretation – 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 – 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

Unit II :ELECTROMAGNETIC WAVES IN BOUNDED MEDIA

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 – Total internal reflection – reflection of plane wave at the surface of the conducting medium – surface impedance – transmission lines – circuit representation of the parallel plane transmission line – inclusion of losses – Transmission line theory and analogy with EM wave

Unit III : OPTICS OF FIELDS

Magnetic currents – Fields due to electric and magnetic distributions – Duality principle – Fields of electric and magnetic current elements – Images of electric and magnetic currents – Electric, magnetic and crossed current sheets as sources – Impressed and Induced currents and scattered field – Reciprocity theorem – proof and applications – Field reciprocity and short circuit current – Induction and Equivalence theorem – Radiation field of Huygen's source – Radiation through a rectangular aperture in an absorbing screen – application to open ended wave guides

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 : MICROWAVE DEVICES

Klystron – Magnetron – Travelling wave tube – Circulators, Magic TEE and Hybrid rings – Microwave diodes and Field-effect transistors.

Antennas : Half-wave dipole antenna - Folded dipole – Parasitic array antenna – Antenna stacking - Multi band antenna – Impedance matching to antenna – Parabolic and corner reflectors.

Wave propagation : Ground waves – Sky waves – Radio horizon – Ionospheric layers – Power density – Electric field strength – Skip wave – Space waves.

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. Robert J. Schoenbeck ., Electronic Communications Modulation and Transmission, - Second Edition, Prentice Hall of India, New Delhi, 2002.

Unit	Book	Section
I	1	4.01 – 4.03, 5.01 – 5.06, 6.01 – 6.04
II	1	4.04 – 5.09 – 5.15, 7.10 – 7.12, 7.14
III	1	10.03, 13.01 – 13.08, 13.10
IV	1	7.01 – 7.05, 7.07, 8.01 – 8.04, 8.09, 8.10
V	2	12.73, 12.7.4, 12.7.5, 12.9, 12.12,12.13,10.2, 10.3, 10.6, 10.7, 10.8, 10.12, 10.13, 11.2, 11.3 – 11.3.5, 11.4

Books For Reference :

1. David I.Griffiths, Introduction to Electrodynamics, Prentice Hall of India, New Delhi, 2003
2. Slater and Frank " Electromagnetism"

Sem.II Hours/Week : 6
07PPH225 Credits : 6

MATHEMATICAL PHYSICS – II

Objectives :

- To understand and apply the concepts and technologies of transforms.
- To apply numerical techniques to solve differential and integral equations and to study the statistical distributions.
- To understand tension concept and apply the same to learn the fundamental concepts on general theory of relativity.
- To understand the elements of group theory and apply the concepts of symmetry to point groups.
- To learn C language and apply the same to write simple programs.

Unit I : OPERATIONAL METHODS

Fourier series and Integrals – Fourier Mellin's Theorem – Integral transforms of Laplace and Fourier – Applications of the Operational Calculus to the solution of Partial differential equations – Evaluation of integrals – Physical applications of Laplace and Fourier transforms.

Unit II : TENSOR ANALYSIS AND GENERAL THEORY OF RELATIVITY

Co-ordinate transformation – fundamental types and their representations- algebra of tensors – Christoffel's symbol – the line element and metric tensors – Geodesics – Rieman-Christoffel tensor (curved and flat space-time concept) .

Principle of covariance and principle of equivalence – consequences – interpretations – Doppler effect and rate of a moving clock – clock paradox – transverse Doppler effect and rate of rotating clock – Newton's theory as a first application – gravitational deflection of light ray – gravitational shift in spectral lines.

Unit III : NUMERICAL METHODS AND STATISTICAL METHODS

Numerical integration – Numerical solution of differential equations - Euler's and RK methods – Graphical solution of transcendental equations – Newton-Raphson method – solution of cubic equations - Discrete probability distribution – Continuous distribution expectations – Moments and standard deviations – Binomial distribution – Poisson distribution – Gaussian distribution.

Unit IV : C LANGUAGE AND ITS APPLICATIONS TO NUMERICAL AND STATISTICAL METHODS

C – Character set – constants – variables – operators - Built in functions – structure of a C program- control structures – loop structures – Arrays – functions – Library functions. C programs for Newton Raphson method - Simpson's rule - Runge Kutta 4^{th} order method - Mean and SD of a set of numbers.

Unit V : MATHEMATICAL MODELING AND SIMULATION

The concepts of a system – system environment – stochastic activities – continuous and discrete systems – system modeling – types of models – static physical models – dynamic physical models – static mathematical models – principles used in modeling – the technique of simulation – the Monte Carlo method – comparison of simulation and analytical methods – experimental nature of simulation – types of system simulation – numerical computation technique for continuous models - numerical computation technique for discrete models – distributed lag models – cobwed models – progress of a simulation study.

Books For Study:

1. Pipes, L.A and Harvill, L. R, Applied Mathematics for Engineers and Physicists, McGraw Hill Company, New Delhi, 1987.
2. Tinkham M, Group theory and Quantum Mechanics, McGraw Hill Ltd, New Delhi 1964.
3. Molecular structure and spectroscopy, G.Aruldhas, Prentice Hall of India, New Delhi 2001.
4. Balagurusamy E.- Programming in ANSI - C, Tata McGraw Hill Publishing Company, New Delhi, 2000.
5. Study Material
6. Gordon G, "Systems Simulation", Pentice Hall of India Ltd., 1991.

Unit	Book	Chapter	Sections
I	1	Appendix C	21 – 23, 28
		Ch 4	2,3,11
		Ch 13	2 – 4
II	5	Cyclostyled text	
III	1	Ch 14	4
		Ch 16	1-6, 9-13
		Appendix D	1-4
IV	4	Ch 1 – 7 and 9	1.3, 2.2, 2.5- 2.8,3, 9.1.4, 5.2- 5.9, 6.2-6.5,7.2-7.5,9.4-9.6
V	6	1 and 3	1.1 – 1.1, 3.1-3.10

Books For Reference :

1. Sathyaprakash - Mathematical Physics, Sultan Chand & Sons, New Delhi.
2. Venkataraman, M.K - Numerical Methods in Science and Engineering, Madras National Publishing Co., 1987.
3. Ronal E. Walpole and Reymond H. Myers - Probability and Statistics for Engineers and Scientists, Macmillan Publishing Co Inc., New York,1972.
4. Joshi A.W - Elements of Group Theory for Physicists, Willey Eastern Ltd., Madras, 3rd Edn, 1988.
5. Introduction to Tensor Calculus and Relativity – Dreck F Lawden
6. Vector Analysis – Spiegel
7. Modelling with Differential Equations, by D.N. Burges, M.S. Borrie, 1982.
8. Modelling with Ordinary Differential Equations, by T.P. Dreyer, 1993.

Sem.II Hours/Week : 6
07PPH226 Credits : 6

QUANTUM MECHANICS

Objectives :

- To understand basic idea of Dirac formalism to 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

Bra and Ket notations – Linear operations – Orthogonality of eigen functions – observables – the completeness condition – simultaneous eigenkets of commuting observables – eigen value problem – uncertainty product – harmonic oscillator wave functions – the coherent state – time evolution of the coherent state – the number operator – the unitary transformation – the Schrödinger and Heisenberg pictures – the density operator.

Unit II: ANGULAR MOMENTUM

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 and j=1 – Pauli spin matrices – Pauli wave function and Pauli equation – addition of angular momenta – Clebsh-Gordan Coefficients – concept of isospin.

Unit III: APPROXIMATION METHODS

JWKB solutions – the connection formula – application of JWKB method to alpha decay – JWKB solutions for spherically symmetric potentials – time independent perturbation theory – non-degenerate (first and second order) states – degenerate states – variational method – hydrogen and helium atoms – time dependent perturbation theory – Fermi's Golden rule – Adiabatic approximation – sudden approximation.

Unit IV: THEORY OF SCATTERING

The Green's function technique – the Born approximation – Rutherford scattering formula – partial wave analysis – external and internal logarithmic derivatives – the square well potential – scattering cross section and the optical theorem – the complex potential – very low energy scattering – the scattering length – the effective range theory with potential and without potential – low energy neutron – proton scattering.

Unit V : RELATIVISTIC WAVE EQUATIONS

The Klein – Gordan equation – the Dirac Equation – Dirac's α and β matrices – the continuity equation – the free particle solutions – the hole theory – spin of the Dirac electron-magnetic dipole moment of the electron – the velocity operator – expectation value of the velocity – relativistic invariance of Dirac equation – Lorentz transformation operator – parity operation and time reversal operation on a free Dirac electron – Feynman's theory of positrons.

Books For Study :

1. A.Ghatak and S. Lokanathan, Quantum Mechanics, Macmillan India Ltd. New Delhi. 2003.
2. V. Devanathan, Quantum Mechanics, Narosa Publishing House, New Delhi. 2006.

Unit	Book	Chapters	Sections
I	1	11,12	11.1 – 11.6, 11.8, 12.1 – 12.5, 12.7 – 12.10
II	1	9,13,18	9.1-9.5, 13.1 – 13.6, 18.1 – 18.4
III	1	17, 19, 21, 25	17.1-17.4, 17.7, 19.1-19.3, 21.1-21.3, 25.1-25.2, 25.4, 25.5
IV	2	9	9.1-9.4 (except 9.3.2 and 9.3.5)
V	2	11	11.1 – 11.6 (except 11.1.1, 11.3.2, 11.4.2, 11.5.2)

Book For Reference :

1. Thankappan, V.K - Quantum Mechanics, WileyEastern Ltd., NewDelhi, 2nd edn, 1995.
2. G. Aruldhas,Quantum Mechanics, Prentice Hall of India, New Delhi, 2003.

Sem.II Hours/Week : 4
07PPH227 Credits : 5

PHYSICS PRACTICAL - I

Any 15 of the following :

1. Spectrum photo-Cu, Fe-Arc spectra
2. AlO-Bands
3. Rydberg's constant
4. Absorption spectrum of Iodine
5. Michelson's Interferometer
6. L.G. Plate
7. F.P. Etalon
8. Determination of Planck's constant
9. Photosensitive devices
10. e-Millikan's oil drop method
11. e/m – Zeeman effect
12. e/m- Magnetron
13. Thermionic work function
14. Susceptibility-Guoy's method
15. Susceptibility –Quincke's method
16. Dielectric constant – Lecher wires
17. Dielectric constant – Wavemeter
18. Transmission line characteristics
19. Ultrasonic diffraction
20. Ultrasonic interferometer
21. Microwaves – Gunn diode
22. Microwaves – Klystron
23. Hall effect in Semiconductor
24. Resistivity of Semiconductor
25. Determination of Energy gap of semiconductor
26. G.M. counter
27. Gamma ray spectrometer
28. Experiments with Laser
29. Fiber Optics Experiment
30. Unit cell dimensions-X-ray-Laue/Power photographs
31. Capacitance of Thin Film Capacitor and Dielectric constant
32. V-I Characteristics of Solar Panel
33. Radio wave propagation
34. Elliptic and Hyperbolic fringes
35. Biprism-Wave length and thickness
36. Computer Programming.

Sem.II
07PPH228

Hours/Week : 4
Credits : 5

PHYSICS PRACTICAL – II

Any 15 of the following

1. SCR Characteristics and applications
2. UJT Characteristics and applications
3. BJT Characteristics and amplifier design
4. FET Characteristics and amplifier design
5. JFET and MOSFET applications
6. Programmable UJT
7. Monostable Multivibrator - Transistor
8. Wien's Bridge Oscillator – Transistor
9. Phase Shift Oscillator – Transistor
10. Regulated Power Supply – Zener and Transistor
11. Regulated Power Supply _ I.C.
12. Power Amplifier – Transistor
13. Power Amplifier- I.C.
14. 555 Timer (Astable Multivibrator) and its applications
15. 555 Timer (Monostable Multivibrator) and its applications
16. 555 Timer – Schmitt Trigger
17. Op.Amp. – Parameters
18. Op.Amp – Basic Op. Amp. Circuit Design
19. Op.Amp – I to V and V to I converters
20. Op.Amp – Waveform Generators
21. Op.Amp – Solving first order simultaneous equations
22. Op.Amp – differential and instrumentation amplifier
23. A/D converter- Parallel comparator
24. D/A Converter using op. Amp
25. Clock Oscillator using digital ICs
26. Diac and Triac Characteristics and Applications.
27. Study of Transducers

Sem.III Hours/Week : 6
07PPH329 Credits : 6

SPECTRAL PHYSICS AND PHOTONICS

Objectives :

- To study the theory and understand the technique nature and importance of molecular spectra.
- To study the nature and importance of electronic and resonance spctra.
- To acquire knowledge of the principle of Photonics, lasers devices and their applications in various fields.

Unit I : MOLECULAR SPECTRA

Molecular energy states-classification 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 II : ELECTRONIC SPECTRA

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 III : RESONANCE SPECTRA

NMR spectroscopy –Bloch equation and solution – 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 IV : FUNDAMENTALS OF PHOTONICS

Fundamentals of light and matter: Nature of light – Fundamentals of light-matter interactions – light activated therapy : photodynamic therapy – basic principles – photosensitizes for photodynamic therapy – porphyrin derivatives – benzoporphyrin derivaties – applications of photodynamic therapy – mechanism of photodynamic action – light irradiation for photodynamic therapy.

Unit V : LASER DEVICES AND THEIR APPLICATIONS

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. Straughan B.P. and Walker, S .,Spectroscopy – Vol 1, London:Chapman and Hall, 1996.
2. Straughan B.P. and Walker, S., Spectroscopy – Vol 3, London:Chapman and Hall, 1996.
3. Thyagarajan K & Ghatak A.K ., Lasers – Theory and applications NewDelhi Macmillan India Ltd.,1997.
4. Laud B B –Lasers and Non Linear optics-New Age Intl.Ltd,2004
5. Ralf Menzel – Photonics Linear and Nonlinear Interaction of Laser light and Matter – Springer – New York, 2004
6. Paras N. Prasad – Introduction to Biophotonics – A John Wiley & Sons, Inc., Publication – New Jersy., 2003

Unit	Book	Sections
I	2	1.1,1.4,1.5.1,2.1,2.2.3,2.2.4,2.2.5,2.3.1-2.3.3
II	1	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
III	3	9.1,9.2,9.4,9.6,9.8,10.3,11.1-11.4,13.3,13.9,14.2-14.5
IV	5	Chapter 1
	6	Chapter 4.1 – 4.7 and Chapter 12.1, 12.2.1, 12.2.3, 12.3, 12.4, 12.5
V	4	1.1,-1.4,2.1,2.2,6.1,6.2.1,6.2.2,6.3,6.4,6.6,6.8 – 6.11,13.1,13.2,14.1,14.2,14.4.

Book For Reference :

1. Banwell ., Molecular Spectroscopy, New Delhi :Tata McGraw Hill, 1994
2. Straughan B.P. and Walker, S., Spectroscopy – Vol 2, London:Chapman and Hall, 1996

Sem.III Hours/Week : 6
07PPH330 Credits : 6

MICROPROCESSOR AND MICROCONTROLLER

Objectives :

- To study the architecture and interfacing of a microprocessor and a microcontroller.
- To understand the instruction set and write assembly language programs for a microprocessor and a microcontroller.
- To learn the details of applications of microprocessor and microcontroller.

Unit I : MICROPROCESSOR ARCHITECTURE, MEMORY INTERFACING AND INTERFACING I/O DEVICES

Evolution of Microprocessor, Basic functional blocks of a µp, Microprocessor based system, concept of multiplexing in 8085 µp. Intel 8085- µp signals and pin assignment- Architecture-instruction execution and data flow. Semiconductor memory – ROM- PROM- EPROM- Static RAM- interfacing Static RAM and EPROM. Memory organization in 8085 based system. I/O structure of a typical microcomputer- Interfacing I/O and peripheral devices- Comparison of memory mapping and I/O mapping of I/O device in 8085 based system – I/O mapping in 8085 based system. Examples of memory and I/O interface in 8085 based system

Unit II : MICROPROCESSOR INSTRUCTIONS AND ASSEMBLY LANGUAGE PROGRAMMING

Processor cycles- Machine cycles, Instruction format, Addressing modes of 8085. Instruction set summary. Data transfer, arithmetic, logical, branching and machine control instructions. Timing diagram of 8085 instructions. Levels of programming- Flow chart- Assembly language program development tools – variables and constants used in assemblers-assembler directives- handling procedure in 8085- MACRO. Stack in 8085 µp. Delay routine. Examples of 8085 assembly language programs.

Unit III : INTERRUPTS, INTERFACING PERIPHERALS AND MICROPROCESSOR APPLICATIONS

Interrupt and its need, classification of interrupts. Interrupts of 8085.Peripheral devices and interfacing- Parallel data transfer schemes-Programmable peripheral interface Intel 8255- Interfacing of 8255 with 8085 µp. Serial data communication- USART Intel 8251A. Interfacing 8251A with 8085. Keyboard and display interface using ports- Keyboard/Display controller Intel 8279.Interfacing 8279 with 8085 processor. DAC interface. Interfacing DAC0800 with 8085.ADC Interface-ADC0809.Interfacing ADC0809 with 8085 microprocessor. Intel 8085 µp based systems-Temperature control system-Motor speed control system- Traffic light control system-Stepper motor control system.

Unit IV : MICROCONTROLLER ARCHITECTURE, MEMORY INTERFACING AND INTERFACING I/O DEVICES, AND INSTRUCTIONS

Microprocessors and Microcontrollers. Intel 8031/8051 Microcontroller- pins- signals- Architecture-programming model. Machine cycles and Timing diagram, Stack in 8031/8051 Microcontroller. Memory organization in 8031/8051 based system .Examples of memory and I/O interface in 8031/8051 based system. Addressing modes, classification of 8031/8051 instructions – data transfer, arithmetic, logical, program branching and Boolean variable instructions.

Unit V : MICROCONTROLLER - ASSEMBLY LANGUAGE PROGRAMMING AND APPLICATIONS

Examples of 8031 assembly language programs. Interfacing of 8255 with 8031/8051 Microcontroller. Serial communication in 8051 μc. Interfacing 8279 with 8031/8051 microcontroller. Interfacing DAC0800 with 8031/8051 microcontroller. Interfacing ADC0809 with 8031/8051 microcontroller.

External data memory and program memory, Counter/Timer programming in 8051,8051 serial communication, Interrupt programming, Interfacing Keyboard and display (LED and LCD),Interfacing stepper motor.

Book for Study

1. A.Nagoor Kani,Microprocessors & Microcontrollers,1st edition, RBA Publications, Chennai, 2006.

Unit	Book	Sections
I	1	1.2-1.6, 7.1-7.5, 7.7, 7.9.1, 7.10, 7.11, 7.12.1
II	1	3.1-3.11, 9.1-9.8, 9.11
III	1	8.1-8.3, 10.2.1, 10.2.4, 10.3.1, 10.3.2, 10.4.1, 10.4.2, 10.4.4, 10.4.5, 10.6, 10.7, 12.2.2- 12.2.5
IV	1	2.1, 2.2, 6.1-6.8, 9.8, 7.9.4, 7.12.4
V	1	9. 12, 10. 2. 4, 10.3.3, 10. 4. 5, 10.6.1, 10. 7. 1. Cyclostyled text.

Books for Reference

1. A.P.Godse and D.A.Godse, Microprocessors and its applications (First edition), Technical Publications, Pune , 2006.
2. B.Ram, Microprocessors and Microcomputers, Dhanpat Rai Publications (P) Ltd, New Delhi,2005.

Sem.III Hours/Week : 6
07PPH331 Credits : 6

STATISTICAL MECHANICS AND PLASMA PHYSICS

Objectives :

- ✧ To understand the principles of classical statistical mechanics 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 fluctuations in thermodynamic quantities and the applications of Boltzmann transport equation.
- ✧ To acquire knowledge about the formation of Plasma in lab conditions and of fusion principle for generation of power to meet energy crisis.
- ✧ To analyse the properties, composition and origin of Plasmas in interplanetary space and apply it to find out the possibilities of landing on moon and other planets.

Unit I :CLASSICAL STATISTICAL MECHANICS

Phase space – ensembles and its type – microstates and macro states – classical Maxwell Boltzmann distribution law-Maxwell's law of distribution of velocities – principles of equipartition energy – partition function – connection between partition function and thermodynamics quantities – Boltzmann entropy relation – mean values obtained from the distribution law – most probable speed – mean speed – mean square speed – Root mean square speed

Unit II : QUANTUM STATISTICAL MECHANICS

Transition from classical to quantum statistical mechanics – statistical weight - Identical particles and symmetry requirements – Bose Einstein statistics- Fermi Dirac statistics - Maxwell Boltzmann statistics with quantum conditions. Black body radiation and Planck's radiation law – Bose – Einstein gas - energy and pressure –Electron gas – Free electron model and electronic emission

Unit III : FLUCTUATIONS IN THERMODYNAMIC QUANTITIES AND TRANSPORT PROPERTIES

Fluctuations in thermodynamics quantities – fluctuations in energy, pressure, volume and Electric noise - Transport properties – Boltzmann transport equation Boltzmann transport equation for electron and Lorentz solution – Sommerfeld's theory of electrical conductivity – thermal conductivity of metals – viscosity from Boltzmann equation

Unit IV : CONTROLLED FUSION

Controlled fusion – reactions - the necessity for plasma – ignition temperature – Lawson criterion- problems in developing a fusion reactor- magnetic confinement. Toruses, Stellarators - Tokomaks – multipoles - Relativistic beam devices – Mirrors - pinches – Laser fusion –Fusion technology

Unit V : PLASMAS IN INTER PLANETARY SPACE

Interplanetary space – the solar wind theory and experiments – magnetic fields in interplanetary space experiments – solar – proton streams – solar wind temperature – Shock waves – magnetic field power distribution – cosmic ray modulation by interplanetary magnetic fields – propagation of low energy solar protons and electrons - Solar wind interactions with the moon

Books for Study

1. Gupta S.L & Kumar V ., Statistical Mechanics , Pragati Prakashan, Meerut, 2004.
2. Francis F. Chen .,Introduction to plasma Physics, Plenum Press, London 1977.
3. Stephen WhiteR,Gordon & Beach.,Space Physics, Science Publishers, New York 1970.

Unit	Book	Sections
I	1	1.1, 1.3- 1.4, 2.1,2.7, 210, 2.12, 2.14.2,16, 2,15
II	1	5.2,5.9,6.1-6.4,6.10,8.0,9.3,9.4
III	1	12.1-12.3,12.10,10.1,10.2,10.4,10.5,10.7
IV	2	9.1-9.8
V	3	5.1 - 5.10

Books For Reference

1. Gopal E.S.R.,Statistical Mechanics & Properties of Matter, McMillan, NewDelhi 1976.
2. Agarwal B.K & Melin Eisner., Statistical Mechanics,: Wiley Eastern Ltd., New Delhi 1989.
3. Boyd, R.L.F., Space Physics the study of Plasma in Space, Oxford University Press, London ,1974.

Sem.IV Hours/Week : 6
07PPH432 Credits : 6

CONDENSED MATTER PHYSICS

Objectives :

- To study the crystal packing and imperfections
- To study Lattice vibration, diffusion, and thermal properties.
- To study conductor, super conductor and semiconductor
- Nanomaterial magnetic and dielectric materials.

Unit I : Packing of atoms in crystals and imperfections

Close packing of equal spheres in 3D – Classification of close packings– Axial ratio and Lattice constants – Voids – Size, Coordination and Significance – Packing of unequal spheres in 3D – Representation of close packings – Pauling's rule – applications to actual structures – Interpretation of Bragg's equation – Ewald construction – Reciprocal lattice – Point imperfection – Line imperfection – Surface imperfection-color centers

Unit II :LATTICE VIBRATIONS, ATOMIC DIFFUSION AND THERMAL PROPERTIES

Dynamics of chain of identical atoms and diatomic linear chain – Dynamics of identical atoms in 3D – Experimental measurements of dispersion relation – Anharmonicity and thermal expansion – Atomic diffusion – Diffusion mechanics – Specific heat of solids – Einstein's model – Density of states – Debye model – Thermal conductivity of solids (electrons and phonons) – Thermal resistance of solids

Unit III : CONDUCTORS AND SUPERCONDUCTORS

Effect of temperature on FD function – Electrical conductivity of metals and Ohm's law – Widemann–Franz–Lorentz law – Electrical resistivity of metals — Nearly free electron model – Tight binding approximation – Fermi surfaces in metals – Characteristics and effect of electric field and magnetic fields of FS – Quantization of electron orbits – London equations and Penetration depth – Coherence length – Elements of BCS theory – Flux quantization – Normal tunnelling – AC and DC Josephson effect – High T_c superconductivity –applications

Unit IV : SEMICONDUCTORS AND NANOMATERIALS

Free carrier concentration in semiconductors – Fermi level and carrier concentration – Mobility of charge carriers – Effect of temperature on mobility – Electrical conductivity of semiconductors – Hall effect in semiconductors – Junction properties of metal and semiconductor – Basics of nanomaterials-quantum size effects-quantum dots- quantum wells-quantum wires-nanoclusters and super lattices-physics of carbon nano tubes -applications

Unit V : MAGNETIC PROPERTIES AND DIELECTRICS

Fundamentals of quantum theory of Paramagnetism – Paramagnetism of free electrons – Ferro magnetism – Weiss molecular field – Temperature dependence of spontaneous magnetization – Domain theory – Antiferromagnetism – Ferrimagnetisms and Ferrites - Local electric field at an atom – Dielectric constant and its measurement – Polarizability – Electronic and Dipolar polarizability – Piezo, Pyro and Ferro electric properties of crystals – Ferroelectricity – Ferroelectric domain – Ferricelectricity

Book for Study :

1. Wahab, M.A.., Solid State Physics, Narosha publication house, New Delhi, 1999.

Unit	Book	Sections
I	1	3.3 – 3.12, 8.9 – 8.11, 5.2, 5.4, 5.12, 15.6.
II	1	7.2 – 7.6, 6.1, 6.6, 9.2, 9.4 – 9.10.
III	1	10.7, 10.9, 10.11 – 10.13, 11.7, 11.8, 12.4 – 12.8, 17.8-17.14
IV	1	13.2 – 13.8, Cyclostyled text.
V	1	16.10 – 16.14, 16.17-16.19, 14.5, 14.13.

Books for Reference:

1. Charles Kittel., Introduction to Solid State Physics, Fifth edition, John Wiley and sons, New Delhi, 2003.
2. Sexana, B.S and Sexana , P.N., Solid State Physics, Pragati Prakasan, Meerut, 1978.

Sem.IV Hours/Week : 6
07PPH433 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 types 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

Nuclear mass and binding energy - atomic masses – systematics of nuclear binding energy – nuclear size – charge radius – potential radius - spin and parity – statistics of nuclei – 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

Unit II : NUCLEAR DECAY AND RADIOACTIVITY

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 – Sergent 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

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 – stripping and pickup 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

Production of new particles in high energy reaction – classification of elementary particle – fundamental interaction – Quantum numbers – anti particles – resonances – laws in production and decay process - symmetry and conservation laws – special symmetry groups – Gelman Neeman theory – Quark model – SU_3 symmetry – unification of fundamental interaction

Unit V : ASTROPHYSICS AND RADIO ASTRONOMY

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, Nuclear physics and particle physics, Sultan Chand and sons, First edition 2005.
3. Joshi A.W, Horizons of Physics, Wiley Eastern Ltd

Uni	Book	Sections
I	1	2.1 –2.13, 17.2, 17.3, 17.4, 17.6 , 17.8
II	1	4.9-4.12, 5.5- 5.7, 5.9, 5.10, 5.13, 5.17, 5.19
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.

Sem.IV Hours/Week : 6
07PPH434 Credits : 6

COMMUNICATION PHYSICS

Objectives :

- To acquire knowledge about analog and digital modulation and demodulation techniques
- To understand the concepts and techniques involved in communication by optical fiber and satellite
- To learn the working principles of telephone, fax and cell.

Unit I : SINGLE SIDEBAND COMMUNICATION SYSTEMS AND ANGLE MODULATION

Single sideband systems - mathematical analysis of suppressed carrier AM- ring and FET push pull balanced modulators - single side band transmitters and BFO receivers - ISB.
Angle modulation - mathematical analysis - phase deviation and modulation index-frequency deviation and percent modulation - deviation ratio-commercial broadcast band FM – pre-emphasis and de-emphasis- FM and PM modulators – direct FM and indirect FM transmitters – FM demodulators and receivers – limiter circuits – FM vs PM.

Unit II : DIGITAL MODULATION, TRANSMISSION, MULTIPLEXING AND DATA COMMUNICATIONS

Introduction to digital modulation, Medium speed and high speed Modems - dual four level converters. Digital transmission - pulse modulation - PAM-TDM-PWM-PPM-FDM-PCM.
Data communications-Codes-data forms- transmission modes between stations- networks-parity -asynchronous and synchronous transmission-data communications hardware and circuits – LCU - UART and USRT- RS232C interconnect cable-protocol
Introduction to broad band communications.

Unit III : OPTICAL FIBER COMMUNICATIONS AND SATELLITE COMMUNICATIONS

Optical fiber communications- optical fiber types - Advantages and disadvantages of optical fiber cables - Block diagram of an optical fiber communication system- light propagation-optical fiber configurations and classifications-losses in optical fiber cables-light sources and optical sources- light detectors.
Satellite communications-satellite orbits- geosynchronous satellites-antenna look angles-satellite classifications, spacing and frequency allocation-satellite antenna radiation patterns-footprints-satellite system link models.

Unit IV : TELEPHONE SYSTEM AND FAX

Telephone system – Telephony - Telephone instruments-Telephone transmitter and receiver-Electronic telephone – dialer - ringer-transmission bridges-telephone relays-automatic telephony- strowger exchange- crossbar switch and exchange - electronic telephone exchanges - SLIC. Coaxial cable and microwave application in telephone networks- private telephone networks and wireless local loop.
Fax –Facsimile transmission and reception.

Unit V : CELLULAR TELEPHONE COMMUNICATIONS

Cellular telephone concepts- Mobile telephone service-evolution of cellular telephone-cellular telephone-frequency reuse-interference-cell splitting, sectoring, segmentation and dualization-cellular system topology-roaming and handoffs-cellular telephone network components.

Cellular telephone systems - First generation analog cellular telephone - personal communications system - Second generation cellular telephone systems - digitalcellular telephone - global system for mobile communications-personal satellite communications system.

Global Positioning System and General Packet Radio Service.

BOOKS FOR STUDY

1. Wayne Tomasi ,Electronic Communications Systems, (Fundamentals through advanced) Fifth Edition, Pearson Education, Inc 2006.
2. Robert J Schoenbeck-Electronic Communications, Prentice Hall of India, New Delhi, 2002.
3. Anokh Singh-Principles of Communication Engineering, S.Chand &Co., New Delhi, 2001.

Unit	Book	Sections
I	1	6.2 – 6.4, 6.5.1, 6.5.2, 6.6, 6.7,6.8.1, 6.8.2, 7.1-7.3, 7.5-7.8, 7.11, 7.12, 7.16, 7.17.1.1, 7.17.2.1, 7.18, 7.19.2, 7.20, 7.21, 8.1-8.4, 8.6.2, 8.7
II	1	9.1, 9.2, 10.1-10.4, 10.12-10.14, 21.1, 22.8 - 22.10.
	2	15.1-15.7, 15.10-15.11, 15.13-15.15, 15.18-15.20, 2.4 Cyclostyled Text
III	1	13.3-13.13 , 25.4-25.9
IV	3	2.5,2.6,12.1,12.2. Cyclostyled Text
V	1	19.1-19.10, 20.1- 20.6, 20.9, 20.10 . Cyclostyled Text

Sem.IV Hours/Week : 4
07PPH435 Credits : 5

PHYSICS PRACTICAL – III

Any 16 of the following :

1. Logic expression – Simplification using Karnaugh Map and implementation (SOP and POS) – Basic and Universal gates.
2. BCD Addition and Subtraction
3. Arithmetic Logic Unit.
4. Shift Register construction using Flip-Flops, and Shift Register IC study.
5. Multiplexer and Demultiplexer
6. Encoders and Decoders
7. Scalars and display devices.
8. Multiplexed display system
9. Asynchronous counter – Design for a Mod 'n' counter and study of counter IC.
10. Synchronous counter – Design for particular sequence and study of counter IC.
11. Read only memory – Construction /IC study.
12. Read/Write memory – construction /IC study.
13. Parity Generator /Checker
14. Code converters.
15. Digital comparator
16. Microprocessor Programming – I Data transfer and Rotate operations
17. Microprocessor Programming – II – Arithmetic operations, Addition, Subtraction Multiplication and division.
18. Microprocessor Programming – III- Code conversion, Array manipulation, look up table
19. Microprocessor Interfacing – I – Display and waveform generation.
20. Microprocessor Interfacing – II – Voltage/Temperature measurement
21. Microprocessor Interfacing – III – Traffic control
22. Microprocessor Interfacing – IV – Stepper Motor control
23. Study of Modulation and Demodulation – PAM, PPM, PWM.
24. Study of Balanced Modulator.
25. Study of Frequency Modulation and Demodulation.
26. Study of Pulse code Modulation and Demodulation.
27. PCB design and construction.
28. Digital Modulation – ASK and FSK
29. Microcontroller – Programming
30. Microcontroller - Interfacing.

EXTRA DEPARTMENT COURSES (EDC)
OFFERED BY THE VARIOUS DISCIPLINES DURING II AND III SEMESTERS

Sem	Code No.	Title of the Paper	Hr	Cr
Department of Biochemistry				
II	07PBI261	Applied Nutrition*	4	3
III	07PBI362	First Aid Management*	4	3
Department of Biotechnology				
II	07PBT261	Basics of Bioinformatics*	4	3
III	07PBT362	Geomics and Proteomics	4	3
Department of Botany				
II	07PBO261	General Microbiology	4	3
III	07PBO582	Remote Sensing and Geographical Information System	4	3
Department of Chemistry				
II	07PCH261	Environmental Science	4	3
III	07PCH362	Industrial Chemistry	4	3
Department of Commerce				
II	07PCO261	Fundamentals of Accounting for Managers	4	3
III	07PCO362	Management Concepts and Organizational Behaviour	4	3
Department of Computer Science (SFS)				
II	07PCS261	Internet Concepts*	4	3
III	07PCS362	Interpersonal Soft Skills*	4	3
III	07PCS363	Computer Applications for Social Sciences*	4	3
Department of Computer Science (MCA)				
II	07PCA261	Internet Concepts	4	3
II	07PCA262	Foundations of Computer Science	4	3
III	07PCA363	Computer Applications for Social Sciences	4	3
III	07PCA364	Fundamentals of Programming	4	3
Department of Economics				
II	07PEC261	Economics for Managers	4	3
III	07PEC362	Indian Economy	4	3
Department of Electronics				
II	07PEL261	Electronics in Communication*	4	3
III	07PEL362	Computer Hardware*	4	3
Department of English				
II	07PEN261	English for Specific Purposes	4	3
III	07PEN362	Interviews and Group Dynamics	4	3

Department of French

II	07PFR261	Beginners Course in French	4	3
III	07PFR362	Advanced Course in French	4	3

Department of History

II	07PHS261	Public Administration*	4	3
III	07PHS362	Applied Tourism*	4	3

Department of Human Resource Management

II	07PHR261	An Introduction to Human Psychology	4	3
III	07PHR362	Personality and Soft Skills Development	4	3

Department of Mathematics

II	07PMA261	Operations Research	4	3
III	07PMA362	Numerical Methods	4	3

Department of Physics

II	07PPH261	Physics for Rural Development**	4	3
II	07PPH262	Modern Photography**	4	3
III	07PPH362	Medical Physics**	4	3

Department of Tamil

II	07PTA261	அரசுப் பணித்தேர்வுத் தமிழ் - I*		
III	07PTA362	அரசுப் பணித்தேர்வுத் தமிழ் - **II***	4	3

Non-Departmental Courses

Journalism (Rev. Dr. Joseph Lourduraj)

II	07PJO261	Beginners Course in Journalism	4	3
III	07PJO362	Advanced Course in Journalism	4	3

Law (Mr. C. M. George)

II	07PLA261	Beginners Course in Law	4	3
III	07PLA362	Advanced Course in Law	4	3

Shorthand (Mr. Santhanasamy)

II	07PSH261	English Shorthand-I	4	3
III	07PSH362	English Shorthand-II	4	3

4. * Offered by Self Financing Section
5. ** Both Day & Self Financing Section