Sadakathullah Appa College
(Autonomous)

(Reaccredited with 'A' Grade and ISO 9001:2008 Certified)

Rahmath Nagar, Tirunelveli – 627 011

DEPARTMENT OF PHYSICS
(Unaided)

MY LORD VOUCHSAFE ME WISDOM

CBCS SYLLABUS (2015-2018)

For

M.Sc. Physics

(Applicable for students admitted in June 2015 and onwards)

(As per the Resolutions of the Academic Council Meeting held on 11-03-2015)

CONTENTS

Sadakathullah Appa College (Autonomous), Tirunelveli – 627 011

DEPARTMENT OF PHYSICS

M.Sc. Physics Syllabus (2015-2018)

Course Structure (CBCS)

I Semester			**II Semester**		
Course	**H/W**	**C**	**Course**	**H/W**	**C**
Core 1	6	4	Core 5	6	4
Core 2	6	5	Core 6	6	5
Core 3	6	5	Core 7	6	5
Core 4	6	5	Core 8	6	5
Core Practical – I *	6	–	Core Practical–I	–	3
			Core Practical – II	6	3
Total	**30**	**19**	**Total**	**30**	**25**
III Semester			**IV Semester**		
Core 9	6	5	Core 12	6	5
Core 10	6	5	Core 13	6	5
Core 11	6	5	Core 14 – Project	6	5
Core Practical – III *	6	–	Core Practical – III*	–	3
Non Major Elective	6	5	Core Practical – IV*	6	3
			Core Elective	6	5
Total	**30**	**20**	**Total**	**30**	**26**

* Examination at the end of Even semester

Distribution of Hours, Credits, No. of Papers, & Marks

Subject	**Hours**	**Credits**	**No of papers**	**Marks**
Core + practical	108	80	14 + 4	1800
Major Elective	6	5	1	100
Non Major Elective	6	5	1	100
Total	**120**	**90**	**20**	**2000**

Sadakathullah Appa College (Autonomous), Tirunelveli – 627 011
Department of Physics (PG)
CBCS SYLLABUS – M. Sc. PHYSICS
(Applicable to students admitted in June 2015 and onwards)

SEM	P	Title of the paper	S. Code	H/W	C	Marks		
						I	E	T
I	C1	Classical Mechanics and relativity	15PPHC11	6	4	25	75	100
	C2	Mathematical Physics – I	15PPHC12	6	5	25	75	100
	C3	Electronic Devices	15PPHC13	6	5	25	75	100
	C4	Material science	15PPHC14	6	5	25	75	100
	CP1	Physics (PG) Core Practical – I	-	6	-	Examination II Semester		
II	C5	Mathematical Physics – II	15PPHC21	6	4	25	75	100
	C6	Quantum Mechanics-I	15PPHC22	6	5	25	75	100
	C7	Statistical Mechanics	15PPHC23	6	5	25	75	100
	C8	Microprocessor and Micro controllers	15PPHC24	6	5	25	75	100
	CP1	Physics (PG) Core Practical – I	15PPHC2P1	-	3	40	60	100
	CP2	Physics (PG) Core Practical - II	15PPHC2P2	6	3	40	60	100
III	C9	Electromagnetic theory	15PPHC31	6	5	25	75	100
	C10	Quantum Mechanics-II	15PPHC32	6	5	25	75	100
	C11	Spectroscopy	15PPHC33	6	5	25	75	100
	CP3	Physics (PG) Core Practical – III	-	6	-	Examination IV Semester		
	E(NM)	Choose from the List	-	6	5	25	75	100
IV	C12	Solid State Physics	15PPHC41	6	5	25	75	100
	C13	Nuclear and Particle Physics	15PPHC42	6	5	25	75	100
	C14	Project	15PPHP41	6	5	-	100	100
	CP3	Physics (PG) Core Practical – III	15PPHC4P1	-	3	40	60	100
	CP4	Physics (PG) Core Practical – IV	15PPHC4P2	6	3	40	60	100
	E(M)	Optoelectronics and Lasers	15PPHE1A	6	5	25	75	100
		Communication Electronics	15PPHE1B					
			Total	**120**	**90**	**535**	**1465**	**2000**

* Offered to other major students

14-Core
E(NM) - 1
EM - 1

Non-Major Elective Subject offered by the Department of Physics (PG) to other courses PG Students

(Applicable to students admitted in June 2015 and onwards)

SEM	P	TITLE OF THE SUBJECT	S.CODE	H/W	C	MARKS		
						I	E	T
III	E(NM)	Renewable Energy Sources	15PPHN31	6	5	25	75	100

LIST OF NON-MAJOR ELECTIVE SUBJECTS OFFERED BY VARIOUS POST GRADUATE DEPARTMENTS (UNAIDED)

SEM	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
					I	E	T
	DEPARTMENT OF ENGLISH (PG)						
III	English For Business Communication	15PENN31	6	5	25	75	100
	DEPARTMENT OF COMPUTER SCIENCE (PG)						
III	Internet Concepts and Web Design	15PCSN31	6	5	25	75	100
	DEPARTMENT OF MATHEMATICS (PG)						
III	Basics in Mathematics	15PMAN31	6	5	25	75	100
	DEPARTMENT OF PHYSICS (PG)						
III	Renewable Energy Sources	15PPHN31	6	5	25	75	100

I SEMESTER			
C1	CLASSICAL MECHANICS AND RELATIVITY		15PPHC11
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I: LAGRANGIAN, HAMILTONIAN DYNAMICS & VARIATIONAL PRINCIPLE

Mechanics of a particle – System of particles – Constraints – D' Alembert's principle – Lagrange's equation – Velocity dependent potentials – Dissipation functions – Applications of Lagrange's formulation – Hamilton's principle – Calculus of variation – Lagrange's equation form Hamilton's principle – Advantage of variation principle formulation- Principle of least action.

UNIT II: TWO BODY CENTRAL FORCE PROBLEM

Reduction of two body problems into one body and equivalent one dimensional problem – Equation of motion of first integrals – Virial theorem – Kepler's problems – Scattering in a central force field – Transformation of scattering problems to laboratory coordinates.

UNIT III: DYNAMICS OF RIGID BODY AND SMALL OSCILLATIONS

Rigid body motion – Independent coordinates of a rigid body – Matrix transformation – Euler's angles – Coriolis Force – Angular momentum and Kinetic energy – Euler's equations – Torque free motion – Cyclic co-ordinates –Small Oscillations – Normal co-ordinates – Eigen values – Linear triatomic molecule ~~– Forced vibrations.~~

UNIT IV: CANONICAL TRANSFORMATION& HAMILTON'S JACOBI THEORY

Canonical transformation – Generating Functions – Properties – Poisson's brakets – Poisson braket formulation for equations of motion – Hamilton's Jacobi theory – Harmonic Oscillator problems – Hamilton's characteristic Function – Separation of variables – Action angle variables.

UNIT V: SPECIAL THEORY OF RELATIVITY& RELATIVISTIC MECHANICS

The special theory of Relativity – Lorentz transformation – A Four dimensional formulation – Relativity elastic scattering – The Lagrangian and Hamiltonian formulation of relativistic mechanics – A covariant Lagrangian and Hamiltonian formulation.

TEXT BOOKS:

1. Classical Mechanics – Gupta, Kumar and Sharma, Pragati prakaskan Publications.
2. Classical Mechanics – B. D. Gupta, Satya Prakash and Kedarnath Ramnath (2012)

REFERENCE BOOKS:

1. Classical Mechanics – Herbert Goldstein, Addison-wesley, third edition (2001)
2. Classical Mechanics of Particles and Bodies – Kiran C. Gupta, New Age Publishers(2008)
3. Classical Mechanics – V.B. Batia, Narosa Publication (1997.)

unit IV -1.5%

I SEMESTER			
C2	MATHEMATICAL PHYSICS – I		15PPHC12
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT – I: LINEAR VECTOR SPACE & MATRICES

Vector operations in curvilinear co ordinates (rectangular, spherical polar and cylindrical Polar co ordinates) – Linear independence of vector – Dimensions – Basis – Inner product – Schmidt orthogonalization – Process – Matrix representation of vectors – Similarity transformation of matrix – Eigen value and Eigenvectors of matrix.

UNIT II: POLYNOMIALS

The Wronskian – homogeneous equations – Non homogeneous equations – Power series solution – Linear independence of solutions – Legendre differential equations and its solutions – Legendre polynomial – Generation function – Rodrigue's formula – Orthogonal property – Recurrence formula – Hermite polynomial – Orthogonal property – Recurrence formula – Rodrigue's formula.

UNIT III: FOURIER TRANSFORMS

Introduction – Fourier transform – Properties of Fourier transform – Fourier transform of derivative – Fourier sine and Cosine transform of a derivative – Inverse Fourier transform – Evaluation of integrals.

UNIT IV: ABSTRACT GROUP THEORY

Group postulates– Abelian group – The generators of finite group – Cyclic group –The group multiplication table – Rearrangement theorem – Subgroups – Cosets – Conjugate elements and classes - Isomorphism and Homomorphism –Cayley's theorem - Group symmetry of a equilateral triangle - Group symmetry of a equilateral square

UNIT V: REPRESENTATION OF GROUPS

Reducible and irreducible representations – Some important theorems on representation (Theorem1, 2 & 3) - Orthogonality Theorem –The character of a representation: character tables – C_{2V} & C_{3V}.

TEXT BOOKS:

1. Mathematical Physics–Satya Prakash–Sulthan Chand & Sons–New Delhi (2005)
2. Matrices and Tensors in Physics – A W. Joshi, Thiru edition – New Age International (P) Ltd (1995).
3. Elements of Group theory of Physicists – A.W. Joshi – Wiley Eastern Ltd (1975)

REFERENCE BOOKS:

1. Group theory and Quantum Mechanics – Michael Tinkham, TMH edition (1974).
2. Matrices – Frank Ayers-Schaum's Series – TMH adition McGraw-Hill(1984)
3. Laplace Transform – Schaum's Series – Murray R. Spiegel – Mc Graw Hill (1965)
4. Fourier analysis – Schaum's Series – Murray R. Spiegel – MC Graw Hill (1987)
5. Mathematical Physics – E- Butkov – First edition – Addition – Wesley Publishing Company (1973).
6. Vectors and Tensors – Spiegel – Schaum Series – McGraw-Hill(1959)

unit I-2%
unit V - 2%

I SEMESTER			
ELECTRONIC DEVICES			15PPHC13
C3			
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I: TRANSISTORS

JFET, BJT, MOSFET and MESFET – Structure – Working- Derivations of the equations for I. V characteristics under different conditions – High Frequency limits- Fabrication of MESFET.

UNIT II: PHOTONIC DEVICES

Radiative and non radiative transitions – Optical absorption – Bulk and thin Film – Photoconductive devices (LDR) – Diode photo detectors – Solar cell (open circuit voltage and short circuit current, fill factor) LED (high frequency limit – Effect of surface and indirect combination current, operation of LED) – Diode lasers (conditions for population inversion in active region, line confinement factor) – Optical gain and threshold current for lasing.

UNIT III: MEMORY DEVICES

Static and Dynamic random access memories SRAM and DRAM – CMOS and NMOS – Non-volatile – NMOS – Magnetic – Optical and ferro elective memories – Charge Coupled Devices (CCD)

UNIT IV: ADVANCED ELECTRONIC DEVICES

Electro Magnetic effect – Optic and Acoustic – Optic effects – Material Properties related to those effects – Important Ferro electric liquid crystal devices – Piezo electric – Electrostrictive and Magneto strictive effects – Important material exhibiting these properties and their applications in sensors and actuator devices- Acoustic Delay lines–Piezo electric devices – Surface acoustic wave devices.

UNIT V: MICROWAVE DEVICES

Tunnel diode – Transfer electron devices (Gunn diode) – Avalanche transit time devices – Impatt diodes – Parametric devices: V-I Characteristics- Energy level diagram- Equivalent circuit- Applications-Advantage & disadvantages.

TEXT BOOKS:

1. Electronic devices and circuits-salivahanan, Tata McGraw Hill Publications (1998) (Unit 1,2,3&5)
2. Opto electronics: An introduction- John Wilson, J.F.B.Hawkes, Prentice Hall Publications, Third Edition (Unit 4)

REFERNCE BOOKS:

1. Semiconductor devices – Physics and technology by SM.SzeWiley (1985)
2. Opto electronics – Ajay Ghatak and Thyagarajan, Cambridge University Press (1989).

No change

I SEMESTER			
C4	MATERIAL SCIENCE		15PPHC14
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I: CRYSTALLINE MATERIALS

Introduction – Crystal symmetry- Simple crystal structures-Polymorphism and allotropy-Crystal directions- Crystal imperfections-Structure determination by x-ray diffraction-Bragg's law-determination of lattice parameters (Bragg's x-ray spectrometer method) - The laue's method-The powder method-The rotating crystal method.

UNIT II: CONDUCTING MATERIALS

Introduction- The classical free electron theory-Wiedmann-Franz law- The quantum free electron theory – Fermi distribution function-Density of energy states-Electrons in the periodic potentials – Conductors- High resistivity materials-Super conductivity-General features-Effect of magnetic field- The Meissner effect-Thermal properties-London equation-Penetration depth-BCS theory-Josephson effect.

UNIT III: SEMICONDUCTING MATERIALS

Introduction- Elemental intrinsic semiconductors - Carrier concentration in intrinsic semiconductors - Electrical conductivity - Extrinsic semiconductor - Carrier concentration in N-type and P-type semiconductors-Variation of carrier concentration with temperature-Direct and Indirect band gap semiconductors-Semiconductor materials-Hall effect-Applications

UNIT IV: NANO MATERIALS

Carbon nanotubes- Quantum well- Quantum wire- Quantum dot- quantum confinement - Nanophase materials- Synthesis-Physical method- Ball milling-Vacuum sputtering- chemical method-Co-precipitation method-Sol-gel method- Variation of physical properties with geometry.

UNIT V CHARACTERIZATION OF MATERIALS

Components of a microscope-Types of microscope-Instrumentation and applications of TEM, SEM, AFM- XRD- UV-VIS spectrophotometer -TG-DTA and DSC.

TEXT BOOK:

1. Materials science P.K.Palanisamy II Edition, Sciteth Publication (India) Pvt. Ltd. Chennai (2007) (Chapters 1,2,3,4,5 & 6)
2. Bio-Instrumentation, Veerakumari.L, MJP Publishers (2011)
3. Nano: The Essentials – T.Pradeep, Tata McGraw Hill Publications (2007)

REFERENCE BOOKS:

1. 1.Materials science and Engineering,V.Raghavan IV Edition, Prentic Hall of india Pvt.Ltd New delhi.
2. 2.Materials science Dr.M. Arumugham, Anuradha agencies Kumbakonam.

No change

I SEMESTER		
CP1	PHYSICS (PG) CORE PRACTICAL - I *	15PPHC2P1
Hrs/Week : 6	Hrs/Sem : 90	Credits : 5
	* Examination at the end of II Semester	

(Any Ten)

1. Magnetic Susceptibility - Quinke's Method
2. Hyperbolic fringes – Determination of elastic constants
3. Ultrasonic interferometer – ratio of compressibility in 2 liquids
4. Cauchy's constants by least sequence fit (Experimental method)
5. Force constant calculation from vibration spectrum
6. Mutual inductance – coupling co efficient as a function of distance and angle.
7. ESR Spectrometer – Determination of Lande's g-factor
8. GM Counter – Characteristics
9. Temperature co efficient of a thermistor
10. Optical fibre – Characterization of 660 nm of 850 nm LED and Phototransistor
11. Optical fibre – Determination of Numerical Aperture,acceptance angle, power loss and attenuation co efficient
12. Particle size determination using He-Ne laser
13. Spectrophotometer- Absorption spectrum studies/verification of Beer Lambert's Law.
14. Resistivity –Four probe method

unit II - 5%
unit IV- 2%

II SEMESTER			
C5	MATHEMATICAL PHYSICS – II		15PPHC21
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I: COMPLEX VARIABLE

Functions of complex variable – Cauchy Riemann conditions – Cauchy's integral theorem and integral formula – Taylor's series – Laurent's series – Cauchy residue theorem – Singular points of an analytic function – The point at infinity – Evaluation of residues.

UNIT II: POLYNOMIALS

Bessel's equation – Solution of Bessel's equation – Bessel's function $J_n(x)$ and $Y_n(x)$ – Hankel functions – General solutions – Recurrence relations – Orthonormality of Bessel's functions – Generating function – Bessel's integrals – Jacobi series – Laguerre's Differential equation and lagurre polynomials – Generating function – Recurrence formulae – Orthogonal property

UNIT III: PARTIAL DIFFERENTIAL EQUATIONS

Partial Differential equations – Separation of variables – Heat conduction problem – variable linear flow – Temperature inside – Circular and rectangular plates – Cooling of a hot brick – Electrical analogy of heat flow – Current density and total current in a wire – Vibration of stretched strings and membranes (Circular and rectangular)

UNIT IV: TENSORS

Occurrence of tensors in physics – Contravariant & Covariant tensors – Tensors of second rank – Algebra of tensors – Equality and null tensors – Addition and subtraction – outer product – Inner product – Contraction of tensors – Symmetric and Anti-symmetric tensor – Kronecker delta – Quotient law – Metric tensor-Application of tensor (Hooke's law).

UNIT V: SPECIAL FUNCTIONS

Dirac delta function – Different forms derivative of function – Properties – $Xd(x)$, $d(x-a)$, $d(ax)$, $d(x^2 - a^2)$ – Green's functions – Symmetric property – Greens functions for boundary value problems – Green's functions for Poisson's equation

TEXT BOOKS:

1. Mathematical Physics–Satya Prakash–Sulthan Chand & Sons–New Delhi (2005)
2. Matrices and Tensors in Physics – A. W. Joshi, 3rd edition – New Age International (P) Ltd (1995) – UNIT IV (15.1, 15.3, 15.4, 15.5, 16.1 – 16.6, 17.1, 18.1)

REFERENCE BOOKS:

1. Vectors and Tensors – Spiegel – Schaum Series, McGraw-Hill (1959)
2. Theory and Problem of Complex variables – Murray R. Spiegel – Schaum's series – McGraw-Hill (1988)
3. Applied Mathematicsl for Engineers and Physicists – Pipes and Harvil, McGraw Hill International Book Company (1984).
4. Mathematical Physics – E Butkov 1st edition – Addition – Wesley – Publishing Company (1973)

unit I- 20%
unit V-20%

II SEMESTER			
QUANTUM MECHANICS - I			15PPHC22
C6			
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I: FUNDAMENTALS OF QUANTUM MECHANICS

Postulates of quantum mechanics- Equation of motion of matter waves- Physical interpretation of wave function- Normalised and orthogonal wave functions-Solution of Schrödinger equation- Expectation values of dynamical quantities- Probability current density- Ehrensfest's theorem –Uncertainty principle- Mathematical proof of Uncertainty principle for one dimensional wave packet.

UNIT II : BOUND STATE AND POTENTIAL BARRIERS

Bound State Problems – Particle in a box – Infinite potential energy – One dimensional square well potential – Finite potential step – Parity – Linear harmonic oscillator – Rigid rotator-Hydrogen atom .

UNIT III : EQUATION OF MOTION AND MATRIX MECHANICS

Hilbert space – Bra and Ket notation – Equations of motion - Schrödinger picture - Heisenberg picture – Interaction picture - Comparison of three pictures – Matrix theory of Harmonic oscillator – Creation and annihilation operators – Matrix representation for position, momentum,creation and annihilation operation.

UNIT IV: ANGULAR MOMENTUM

Components of angular momentum in Cartesian and spherical polar co ordinates – Spectrum of Eigenvalues for angular momentum operation J^2 and J_z - Raising and lowering operators in angular momentum – Their eigenvalues – Commutation relations between angular momentum operators – Addition of angular momenta- Clebsch Gordan coefficients $j_1=1/2, j_2=1/2$ and $j_1=1, j_2=1/2$.

UNIT V: IDENTICAL PARTICLES & SPIN

Identical Particle – spin angular momentum-One electron system- Two electron system- Electronic spin hypothesis: Stern-Gerlach Experiment- Pauli's spin matrices for electron- commutation relation- Pauli's Eigen function and Eigen values- Density operator and density matrix-Time dependent of density matrix.

TEXT BOOKS:

1. Advanced Quantum Mechanics- Sathya prakash- Kedar Nath Ram Nath Publication, Delhi, 2009
2. P.M. Mathews and Venkatesan – A Text Book of Quantum Mechanics – Tata McGraw-Hill, New Delhi, 1976.

REFERENCE BOOKS:

1. L.I. Schiff – Quantum Mechanics – Mc Graw Hill Book Company, New York, Third edition.
2. V. Devanathan – Quantum Mechanics – Narosa Publishing House Pvt. Ltd., 2005.
3. G. Aruldhas – Quantum Mechanics – Prentice – Hall of India, new Delhi 2002.

unit II - 2%
unit V - 10%

II SEMESTER			
C 7	STATISTICAL MECHANICS		15PPHC23
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I: INTRODUCTION

Objectives of statistical Mechanics – Macrostates, Microstates, phase space and ensembles - Ergodic hypothesis - postulates of equal a priori probability and equality of ensembles average and time average - counting the number of microstates in phase space - Entropy of ideal gas: Sackur - Tetrode equation and Gibb's paradox - Liouville Theorem.

UNIT II: CANONICAL ENSEMBLES

System in contact with a heat reservoir – expression of entropy Canonical partition function - Helmholtz free energy, fluctuation of internal energy – Grand canonical ensemble - System in contact with a particle reservoir - chemical potential - grand canonical partition function and grand potential – fluctuations of particle number.

UNIT III: QUANTUM STATISTICAL MECHANICS

Mean field theory and vander Waal's equation of state, Density Matrix – Quantum liouville theorem - Density matrices for Micro canonical, canonical and grand canonical system - Simple examples of density matrices: Electron gas in metals – Thermionic emission.

UNIT IV: IDENTICAL PARTICLES

Bose Einstein and Fermi Dirac distribution - Equation of state - Bose condensation - Equation of state of ideal Fermi gas - Ising Model – Partition function for one dimensional case - chemical equilibrium and saha ionization formula.

UNIT V: PHASE TRANSITION & LOW TEMPERATURE PHYSICS

Phase transition: First order and second order - critical exponents- Landau's theory of phase transition. Low temperature physics: Measurement of low temperature Helium I & Helium II – Some peculiar properties of Helium II.

TEXT BOOK:

Statistical mechanics, Sathya Prakash, Kedar Nath Ram Nath Publication, Delhi, 2009

REFERENCE BOOKS:

1. Fundamentals of statistical and thermal physics, F. Reif, McGraw – hill, international edition, 1985
2. Statistical mechanics, R.K. Pathira, bufferworgh Heinemann, II edition
3. Statistical mechanics, K. Huang, john willey & sons, II edition
4. Statistical and thermal physics, loknathan and gambhir, prentice – hall of India pvt.lt. 2007

II Semester			
C8	MICROPROCESSOR AND MICROCONTROLLERS		15PPHC24
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

AIM:

To learn the architecture, programming, interfacing and system design concepts of microprocessors and microcontrollers

OBJECTIVES:

- To introduce H/W Architecture, instruction set, programming of microprocessor and microcontrollers.
- To introduce the concepts of interfacing to different peripherals.
- To introduce the basic concepts of system design using microprocessors

UNIT I: INTRODUCTION TO 8 BIT MICROPROCESSORS – H/W AND ARCHITECTURE

Evolution of microprocessors – Intel 8085 microprocessor – Pin configurations and their functions - Architecture – Bus systems – ALU – Flags – Timing control unit – Registers - Interrupts –Machine cycles of 8085- Timing diagram of 8085 instructions.

UNIT II: 8 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING

Instruction and data formats – Addressing modes – Instruction set – Simple assembly language programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulation.

UNIT III 8 BIT MICROCONTROLLER- H/W, ARCHITECTURE, INSTRUCTION SET AND PROGRAMMING

Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, Addressing modes and instruction set of 8051 - Simple programs.

UNIT IV INTERFACING:

Introduction, Generation of I/O Ports, Intel 8255 – Programmable Peripheral Interface, Intel 8279 – Keyboard and display interface, Intel 8254 – Programmable Interval Timers, D/A and A/D converter

UNIT V SYSTEM DESIGNING USING MICROPROCESSORS

Designing a microprocessor based system, Temperature control system, Motor speed control system, Traffic light control system, Stepper motor control system.

TEXT BOOK

1. Microprocessors and microcontrollers – A.Nagoor kani, Tata McGraw-Hill Education Pvt. Ltd., 2nd Edition, 2012
2. Fundamentals of Microprocessors and microcontrollers – B. Ram Dhanpat Rai publications (2005)

REFERENCE BOOKS:

1. The 8051 microcontroller- Kenneth J Ayala, 3rd Edition, Cengage learning, 2010
2. Advanced Microprocessors and Peripherals – A.K. Ray and K M Bhurchandani, Tata McGraw-Hill Ltd., 2007.
3. Microprocessor Architecture, Programming and application with the 8085- Ramesh
4. S.Gaonkar, Penram International Publishing (India) Pvt. Ltd, 4th Edition.

No change

II SEMESTER		
CP2	PHYSICS (PG) CORE PRACTICAL – II *	15PPHC2P2
Hrs/Week : 6	Hrs/Sem : 90	Credits : 5

*** Examination at the end of II Semester**

(Any Ten)

1. Op-amp characteristics – Inverting and Non inverting ampliofiers.
2. Weins bridge and phase shift oscillators – using IC 741
3. Construction of square and triangular wave generator using op-amp.
4. Arithmetic operational using IC 7483
5. Up, down counters using IC7476/7473 and modula counters using 7476/7473 and 7410
6. BCD adder using IC 7483
7. Shift Register operations using IC 7495
8. Shift trigger – using transistors
9. Active filters – Low pass, high pass and Band pass filters using IC 741
10. Counters 2 to 10.
11. UJT characteristics and Relaxation Oscillator
12. AD and DA converters using IC 741
13. SCR Characteristics and power control
14. Constant current source – floating load and grounded load using op-amp and transistor.
15. Characteristics of optoelectronic devices
16. Solution of simultaneous equations using op-amp

No change

III SEMESTER			
C9	ELECTROMAGNETIC THEORY		15PPHC31
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I ELECTROSTATICS

Columb's law- Gauss law- Poisson's equation and laplace's equation–Work done to move a point charge - Energy of a point charge and continuous change distribution-Methods of images- Electric field in dielectric materials-Induced dipoles and polarizability-Connection between polarizability and susceptibility-susceptibility, permittivity and dielectric constant of linear dielectrics

UNIT II MAGNETOSTATICS

Lorentz force law-Biot-Savart's law and Ampere's law-Magnetic vector potential multipole-Expansion of the vector potential- Effects of a magnetic field on atomic orbits-Bound current and its physical interpretations-~~Ampere's law in magnetized material-Magnetic susceptibility and ferro magnetism~~-Magnetic susceptibility and permeability in linear and non linear media

magnetic energy - Dia, para, ferro magnetism

UNIT III ELECTRODYNAMICS

Electromagnetic induction-Faraday's law-Maxwell's equations-Differential and integral form-Boundary conditions on field vectors D,E,B and H-Scalar and Vector potentials-Gauge transformations-Lorentz and coulomb Gauge transformations-Poynting vector and Poynting theorem- Maxwell's stress tensors-Conservation of momentum

UNIT IV ELECTROMAGNETIC WAVES

Monochromatic plane waves- Energy and moment in EM waves in linear media-Reflection and Transmission at normal and oblique incidence-EM waves in conductors wave guides- TE waves in rectangular wave guide- The coaxial transmission line.

UNIT V ELECTROMAGNETIC RADIATION

Retarded Potential- Lenard wiechart potential-Electric dipole radiation-magnetic dipole radiation-Power radiated by a point charge-Larmour formula-Abraham lorentz formula for the radiation reaction-The physical origin of radiation reaction

TEXT BOOK:

Introduction to Electro dynamics, David J Griffith- Third Edition, Prentice Hall of India, Newdelhi (2012)

REFERENCE BOOKS:.

1. Classical Electro dynamics, J.D.Jackson, Wiley Eastern Publication, second edition
2. Foundations of electromagnectic Theory, J.R. Reifz, E.J. milford and R.W.Chris
3. Introduction to Electromagnetic fields and waves-P.Lorrain and D.corson LLC publishers (2013).
4. Electrodynamics – B.P Laud, New Age International Pvt. Ltd(1987)

unit III-20%
unit IV-20%
unit V - 20%

III SEMESTER			
C10	QUANTUM MECHANICS II		15PPHC32
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I APPROXIMATE METHODS FOR BOUND STATES

Time independent perturbation theory – Non degenerate cases – First and second orders –Degenerate case– Removal of degeneracy- Applications-Normal Helium atom – Linear harmonic oscillator in an electric field for the perturbation – First order Stark effect in hydrogen - Variation method – Expectation value of the energy- Application to excited state-ground state of helium atom.

UNIT II TIME DEPENDENT PERTURBATION THEORY

Time dependent perturbation theory-Perturbative solution for transition amplitude-Constant and Harmonic perturbation-Transition probability per unit time (Fermi golden rule)-selection rules-Adiabatic approximation- Sudden approximation.

UNIT III THEORY OF SCATTERING

Scattering amplitude and scattering cross section – Partial wave analysis – Phase shift – Optical theorem-Green's functions for scattering amplitude – Born approximation – Application to screened Coulomb potential – Yukawa potential – Validity of Born approximation –Scattering by a square well potential –Scattering by a hard sphere.

UNIT IV INTERACTION OF RADIATION WITH ATOM

Semi classical theory of radiation-Einstein coefficient for spontaneous and stimulated emission of radiation-Relation between them-Masers and Lasers-Electric dipole approximation-Selection rules.

UNIT V RELATIVISTIC WAVE EQUATION

Relativistic quantum theory –Klein gorden equation-(no solution)-Charge density- Difficulties-Dirac equation – Free particle solution of Dirac equation – Dirac matrices and their properties – Spin of a Dirac particle – Magnetic moment of the electron – Spin orbit energy-Relativistic invariance of Dirac equation-Lorentz transformation operator.

TEXT BOOKS:

1. Advanced Quantum Mechanics- Sathya prakash- Kedar Nath Ram Nath Publication, Delhi, 2009
2. P.M. Mathews and Venkatesan – A Text Book of Quantum Mechanics – Tata McGraw-Hill, New Delhi, 1976.

REFERENCE BOOKS:

1. L.I. Schiff – Quantum Mechanics – Mc Graw Hill Book Company, New York, Third edition.
2. V. Devanathamn – Quantum Mechanics – Narosa Publishing House Pvt. Ltd., 2005.
3. G. Aruldhas – Quantum Mechanics – Prentice – Hall of India, new Delhi 2002.

unit V - 5%

III SEMESTER			
C11	SPECTROSCOPY		15PPHC33
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I INTRODUCTION TO MOLECULAR SPECTROSCOPY

EM spectrum – Interaction of EM Radiation with matter - Molecular Absorption of EM Radiation – Different types of molecular energies –Types of molecular spectra- Emission of Radiant Energy by atoms & molecules- Characteristics of spectral lines- Theoretical principles of molecular spectroscopy.

UNIT II MICROWAVE SPECTROSCOPY

Classification of molecules – Rotational spectra of rigid diatomic molecules – Isotope effect in rotational spectra- Intensity of rotational lines – Linear polyatomic molecules – symmetric molecules- Asymmetric molecules – Microwave spectrometer – Information derived from rotational spectra.

UNIT III INFRARED SPECTROSCOPY

Vibration band – Rotation – Vibration spectra of Polyatomic molecules – Linear molecules – Symmetric top molecules – Interpretation of vibrational spectra – IR spectrometer – Instrumentation – FTIR principle, arrangement and Advantages – Applications of IR Spectroscopy.

UNIT IV RAMAN SPECTROSCOPY & ELECTRONIC SPECTROSCOPY

Raman effect – Rotational Raman spectra – Vibrational Raman spectra- Raman spectrometer – Applications of Raman spectroscopy vibrational coarse structure – Vibrational analysis of Band systems – Frank–Condon principle (Intensity of vibrational Electronic spectra) – Rotational fine structure of Electronic vibration spectra – Photoelectron spectroscopy - Principle & Instrumentation

UNIT V NMR, ESR, NQR & MOSSBAUER

NMR – Magnetic properties of nucleai – Resonance condition – Relaxation process - T_1 and T_2 measurements -Bloch equations – Chemical shift & Coupling constant - Theory of Magnetic Resonance – NMR Instrumentation- ESR – Principle-spectrometer – Hyperfine structure – ESR spectra of hydrogen atom – NQR – Principle – Instrumentation-Experimental techniques in Mossbauer spectroscopy and its applications.

TEXT BOOKS:

1. Molecular structure and spectroscopy, G. Aruldhas, II edition, Prentice Hall of India, Pvt Ltd New Delhi
2. Fundamentals of molecular spectroscopy, colin N. Banwell and Elaine M.Mc cash, IV Edition TMG hill publishing comp New Delhi

REFERENCE BOOKS:

1. Spectroscopy, GR Chatwal and S.K. Anand, Edition II, HP house,New Delhi
2. Molecular spectroscopy, Suresh Chandra, Narosa Publishing house Chennai (2009)

No change

III SEMESTER		
CP3	PHYSICS (PG) CORE PRACTICAL – III *	15PPHC4P1
Hrs/Week : 6	Hrs/Sem : 90	Credits : 2

*** Examination at the end of IV Semester**

Non-Electronics

(Any Ten)

1. Hall effect
2. Elliptical fringes
3. Temperature variation of forward bias voltage for Ge & Silicon
4. Ultrasonic Diffraction – compressibility of liquid
5. Biprism – Determination of wave length (optic bench)
6. Susceptibility – Guoy's method
7. Young's double slit experiment
8. Identification of – x- ray lines -XRD spectrum
9. Dielectric constant –LCR circuit
10. Equipotential surface –different shapes
11. Band gap – Thermistor
12. Calibration of Hall probe in to Gauss meter using search coil
13. Michelson interferometer- wavelength an difference in wavelength of Na light.
14. Resistivity – Four probe method
15. Fraunhofer diffraction – Measurement of Intensity Pattern

No change

IV SEMESTER			
SOLID STATE PHYSICS			15PPHC41
C12			
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I RECIPROCAL LATTICE AND ENERGY BANDS

Diffraction of waves by Crystals – Bragg's law – Scattered wave amplitude – reciprocal lattice vectors – Brillouin zones – Fourier analysis of the basis – Quasi crystals – Bloch function – Kroning penny model – Wave equation of electron in a periodic potential – Number of orbits in a band.

UNIT II CRYSTAL VIBRATIONS

Vibration of crystals with mono atomic basis – Two atoms per primitive basis – Quantization of elastic waves – Phonons momentum – Inelastic scattering by phonons – Phonon heat capacity – Density of states in one and three dimensions – Debye model for density or states – Einstein model of the density of states – Thermal conductivity – Thermal resistivity of phonon gas – UMK Lapp process.

UNIT III FREE ELECTRON FERMI GAS AND FERMI SURFACES

Energy levels in one dimension – Effect of temperature on the Fermi Dirac distribution – Free electron gas in three dimension – Heat capacity of the electron gas – Electrical conductivity and ohm's law – Motion is magnetic fields – Fermi surface – Construction – Calculation of energy bands – Wigner Seitz method – De Haas – Van Alphen effect – Extremal orbits.

UNIT IV DIA, PARA AND FERROMAGNETISM

Langevin's diamagnetic equation – Quantum theory of diamagnetism and paramagnetism – Hund's rule – Paramagnetic susceptibility of conduction electrons – Ferromagnetic order – Magnons – Ferrimagnetic order – Antiferromagnetic order – Ferromagnetic domains.

UNIT V SURFACE AND INTERFACE PHYSICS

Lattice vacancies – Diffusion – Colour centres – Shear Strength of Single crystals – slip – Dislocations – Burgers Vectors – Low angle grain boundaries – Dislocation densities – Strength of alloys – Surface crystallography – Surface electronic structure-Wok function-Thermionic Emission – Magneto resistance in a two dimensional channel.

TEXT BOOKS:

1. Introduction to solid state Physics, Charles Kittel, 7 Edition, John wiley & sons New York, 1996. (Chapters: 2,4,5,6,7,9,,14,15,18,19,20)
2. Solid State Physics, S.O.Pillai,Revised 6 th Edition, New Age International Publishers 2007.

REFERENCE BOOKS:

1. Elementary solids state physics, M.Ali omar, pearson Education, 1999.
2. Introductory solids state physics, H.P.Myres 2nd Edition, Taylor and Francis Ltd.

No change

IV SEMESTER			
C13	NUCLEAR AND PARTICLE PHYSICS		15PPHC42
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I NUCLEAR MODELS

Liquid drop model - weizsacker's Mass formula - Mass Parabola - Nuclear Stability - Bohr wheeler theory of Nuclear Fission – Magic numbers - Evidence for magic numbers - Shell model - Spin orbit coupling mode – Angular momentum and parity of nuclear ground states - Magnetic moment and Schmidt lines.

UNIT II NUCLEAR DECAY

Gamow's theory of alpha decay - Fermi theory of beta decay - Beta spectrum – Fermi and Gamow - Teller selection rules - Neutrino hypothesis - Parity violation – Multipole radiation – Selection rules – Internal conversion - Nuclear isomerism.

UNIT III NUCLEAR FORCES

Ground state of Deuteron – Excited state of Deuteron - Magnetic moment and quadruple moment of Deuteron - Non central Tensor Forces - Meson theory of nuclear forces - n - p Scattering at low energies - Scattering length - phase shift analysis - Spin dependence - Shape independent effective range theory of n - p scattering – p - p scattering at low energies.

UNIT IV NUCLEAR INTERACTION AND NUCLEAR REACTORS

Types of nuclear reactions – Nuclear reaction Kinematics – compound nuclear theory - Reciprocity theorem – Resonance Scattering - Breit Wigner one level formula – classification of Neutrons – Neutron sources - Neutron Diffusion - Neutron current density – leakage - Fermi age Equation – Four factor formula - Critical size of a reactor - Reactor buckling - Classification of nuclear reactor based on fuel and moderator - Research, Breeder and PHWR Reactors.

UNIT V ELEMENTARY PARTICLES

Classification of elementary particles - Particle integrations – Symmetry and Conservation laws - Leptons and Hadrons – C.P.T theorem - Quark Model - Gellmann - Okubo Mass formula – SU(3) multiplet – Meson octet - Baryon octet and baryon decouplet – Bosons – Principle and understanding of LHRC.

TEXT BOOKS:

1. Nuclear Physics, D.C.Tayal, Himalaya Publications (1980).
2. Elements of Nuclear Physics, M.C Pandia and R.P.S Yadav Kedarnath(1972).

REFERENCE BOOKS:

1. 1.Concepts of Nuclear Physics, Bernard Lcohen, Tata - MC.Graw - Hill
2. 2.Nuclear physics an Introduction, S.B Patel, Wiley –Eastern Ltd.
3. 3.Nuclear Physics, R.R.Roy and B.P Nigam, New Age International Ltd.

No change

IV SEMESTER		
C14	PROJECT	15PPHP41
Hrs/Week : 6	Hrs/Sem : 90	Credits : 5

Objective:

Every PG student is required to prepare the project subject related – based on the guidelines of his project guide.

The following are the guidelines to be adhered to

- The project should be an individual one.
- The language for the project is **English**.
- The Minimum number of pages should be **60**.
- Project observations, suggestions and conclusion shall form part of the project.
- The Projects will be evaluated both by the Internal as well as External Examiner each for 100 marks. The distribution of mark should be **60 marks for the Project Report and 40 marks for the Viva-voce Examination**. The Division of marks for the Project Report is as mentioned below:

Particulars	Internal Examiner	External Examiner
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Project to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	20	20
Summary/ Findings/ Conclusion	5	5
Bibliography/ Annexure/ Foot notes	10	10
Total	**60**	**60**

No change

IV SEMESTER		
CP4	PHYSICS (PG) CORE PRACTICAL – IV *	15PPHC4P2
Hrs/Week : 6	Hrs/Sem : 90	Credits : 2

*** Examination at the end of IV Semester**

PROGRAMMING

(Any Ten)

1. Block Move, addition, subtraction, multiplication, logical operations. (8085/8086)
2. Rearranging the numbers- ascending, descending maxima, minima and searching a character of an array (8085/8086)
3. Counters using seven segment LED Display (8085/8086)
4. Simple series Generation- Fibonacci, Tribonacci etc. (8085/8086)
5. Display of any number-rolling display (8085/8086)
6. Analogue to digital converter and digital to analogue converter (ADC & DAC)
7. Waveform generation (Square, sine,Triangular) (8085/8086)
8. Curve fitting to straight line and data interpolation (Cauchy's constant)
9. Currents in wheatstone's bridge – solution of simultaneous equations (Gauss elimination)
10. Solution of radioactive decy problem (or any physics problem) Use Runge kutta or Euler's methods.
11. Evalution of area under the curve-simpsons's rule and monte-carlo method.
12. Eigen values and eigen vectors of symmetry matrices.
13. Matrix multiplication (application – rotation matrices).
14. Newton's Law of cooling (or any physics problem) using numerical differenciation.
15. Solution of transcendental or polynomial equations by the Newton's raphson method.

No change

IV SEMESTER			
E(M)A	OPTO ELECTRONICS AND LASERS		15PPHE4A
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I: LIGHT WAVE FUNDAMENTALS

Electromagnetic waves – Dispersion – Pulse distortion – Information rate – Material dispersion and Pulse distortion – Polarization – Resonant cavities – Reflection at a plane boundary – Critical angle reflections.

UNIT II: LASERS

Laser Principles: Absorption process, Emission process – Einstein relation – Laser operation: Population inversion and derivation of threshold gain K_{th} – gain medium- optical feedback – Threshold condition: line shapes functions - Population inversion and pumping threshold conditions - Mode locking – Active mode locking – Passive mode locking – Q Switching methods: Rotating mirror type Q switching - Q switching using an electro optical switch – Passive Q switching.

UNIT III: LASER SOURCES & DETECTORS

Types of lasers – Ruby laser – Nd:YAG laser – Nd:Glass lasers – He:Ne laser – Co_2 laser – laser diodes – Operating characteristics – Light detectors – Principles of Photo detection – Photo multiplier – Semiconductor photo diode – PIN photo diode – Avalanche Photodiode.

UNIT IV: WAVE EQUATION IN STEP INDEX FIBER

Step index fiber – Graded index fiber – aAtenuation in fiber – Modes in step index fiber – Modes in graded index fiber- Pulse distortion and information rate in optic fiber – Construction of optical fiber cables – Testing of Fibre cable – Selection Criteria – Optical fiber laying in Telephones.

UNIT V: HOLOGRAPHY

Basic operating principle of holography – Gabour hologram and its limitations – practical problems in holography – types of holograms – Fresnel and Fraunhofer holograms – Transmission and Reflection holograms – Multiplex hologram – Application of holography: Holography interferometry – Holography computer memories.

TEXT BOOKS:

1. Laser & Optical Instrumentation, S.Nagabhushana, N.Sathyanarayana - I.K.International Publishing House Pvt.Ltd.
2. Fibre Optic Communication, Joseph C. Palais, Fifth edition, Prentice Hall publication

REFERENCE BOOKS:

1. Photonics Optical Electronics in Modern Communication, Ammon Yariv and Pochi Yeh, Oxford University press.
2. Optical fibers and fiber Optics, Communication System's Subir Kumar Sakar, S. Chand & Co.
3. Introduction to fiber optics, Ajay Ghatah and K. Thiagarajan, Tata Mc Graw Hill.
4. Optoelectronics, J. Wilson and J.F.B. Hawkes, Prentice Hall Publication

No change

IV SEMESTER			
E(M)B	COMMUNICATION ELECTRONICS		15PPHE4B
Hrs/Week : 6	Hrs/Sem : 90	Hrs/UNIT : 18	Credits : 5

UNIT I

Amplitude Modulation – Modulation Index – Frequency Spectrum – Average power – AM modulator Circuits – AM demodulator circuits – AM transmitter AM receiver – Single side band principles – Frequency modulation – Frequency spectrum – Average power – FM transmitter – Phase modulation – Pulse amplitude modulation – Pulse code modulation.

UNIT II

Synchronization – Asynchronous transmission – Probability of bit error in base band transmission – Matched filter – Optimum terminal filter – Bit – Timing recovery – Eye diagram – Digital carrier system – Carrier recovery circuits – Differential phase shift keying – Hard and soft decision decodes – Error control coding.

UNIT III

Dielectric slab wave guide – Modes in the symmetric slab wave guide – TE and TM polarization – Modes in the asymmetric slab wave guide – Coupling to the wave guide – integrated optic networks – LED modulation circuits – Laser diode modulation – Analog modulation format – Digital modulation format – Optic heterodyne receiver.

UNIT IV

Elements of a Radar System – Radar Equation – Radar performance factors – Radar Transmitting systems – Radar Antennas – Deplexers – Radar Receiver and Indicators – pulsed systems – Other Radar system – Black and White TV Transmission and Reception – Colour TV transmission and Reception.

UNIT V

Keplers I, II and III laws – Orbits – Geostationary Orbits – Power systems – Altitude control – Satellite station keeping – Antenna look angle – Limits of visibility – frequency plans and polarization – Transponders – Uplink power budget calculation – Down link power budget calculation – Overall link budget calculation Digital transmission – Multiple access methods.

REFERENCE BOOKS: :

1. Dennis Roddy and Thon Coolen, " Electronic Communication", Pearson Education, Singapore.
2. Kennedy, "Electronic Communication System", Mc Graw Hill publishing Company.

No change

III SEMESTER			
E(NM)	RENEWABLE ENERGY SOURCES		15PPHN31
Hrs/Week : 6	Hrs/Sem : 90	Hrs/unit : 18	Credits : 5

UNIT I: AN INTRODUCTION TO ENERGY SOURCES

Introduction- Energy consumption as a measure of prosperity- World energy future- Energy sources & their availability – Conventional energy sources- New energy technologies – Renewable energy resources- Non renewable energy resources- Obstacles to the implementation of renewable energy system-Advantages of renewable energy - Prospects of renewable energy sources.

UNIT II: SOLAR ENERGY

Introduction – Solar constant- Solar radiation at the earth surface-solar radiation on tilted surface- Solar energy collector: Introduction- Physical principles of the conversion of solar radiation into heat- Flate plate collector – Concentrating collector - Advantages and disadvantages of concentrating collectors over flate plate collectors – Application of solar energy: Solar water heating – Solar cooking.

UNIT III WIND ENERGY

Introduction- Basic principle of wind energy conversion: The nature of the wind- The power in the wind- Forces on the blades- Wind energy conversion- Basic components of a WECS (wind energy conversion system) - Classification of WEC system - Types of wind Machines: Horizontal Axis Machines- Vertical Axis Machines – Application of wind energy: Pumping application - Direct heat application-Electric generation applications.

UNIT IV: OTHER RENEWABLE ENERGY SOURCES

Ocean Thermal Electric Conversion (OTEC): Introduction – Methods of ocean thermal electric power generation- Open cycle OTEC system- Closed cycle OTEC system.

Magneto Hydro Dynamics (MHD) Power Generation: Introduction- Principle of MHD Generation – MHD System: Introduction- Open cycle system- Closed cycle systems- MHD Design problems and developments-Advantages of MHD systems

UNIT V: CHEMICAL ENERGY SOURCES

Introduction – Fuel cells – Design and Principle– Types - Advantages and disadvantages – Applications – Batteries - Introduction – Theory – Different types of batteries – Advantages of batteries for bulk storage.

TEXT BOOKS:

1. Non – Conventional Energy Sources by G.D. Rai, Khanna Publication, New Delhi(1988).
2. Alternate energy soruces by T.N. Veziroglu, Vol.5 and 6, McGraw-Hill(1978).

REFERENCE

1. Solar Energy, by S.P. Sukhatme, Tata Mc. Graw Hill.
2. Solar energies of Thermal processes by A. Duffie and W.A. Becjmann, John – Wily (1980)
3. Principle of solar engineering by F. Krcith and J.F. K Krcider, McGraw-Hill(1978)

SCHEME OF EXAMINATIONS UNDER CBCS (2015 - 2018)

The medium of instruction in all UG and PG courses is English and students shall write the CIA and Semester Examinations in English. However, if the examinations were written in Tamil, the answer papers will be valued.

DISTRIBUTION OF MARKS FOR CIA AND SEMESTER EXAMINATIONS

UNDERGRADUATE, CERTIFICATE & DIPLOMA COURSES

SUBJECT	TOTAL MARKS	CIA TEST	SEMESTER EXAM.	PASSING MINIMUM		
				CIA TEST	SEM. EXAM.	OVER ALL
Theory	100	25	75	Nil	30	40
Practical	100	40	60	Nil	24	40
Project	100	Nil	Report - 60 marks Viva - 40 marks	Nil	40	40

POSTGRADUATE COURSES

SUBJECT	TOTAL MARKS	CIA TEST	SEMESTER EXAM.	PASSING MINIMUM		
				CIA EXAM.	SEM. EXAM.	OVER ALL
Theory	100	25	75	nil	38	50
Practical	100	40	60	nil	30	50
Project	100	nil	Report - 60 marks Viva - 40 marks	nil	50	50

DIVISION OF MARKS FOR CIA

SUBJECT	MARKS	ASSIGNMENT FOR UG / ASSIGNMENT OR SEMINAR FOR PG	REGULARITY	RECORD NOTE	TOTAL MARKS
Theory	20	5	--	--	**25**
Practical	30	--	5	5	**40**

1. The duration of CIA theory examination is **ONE** hour and the semester examination is **THREE** hours.
2. **Three CIA tests of 20 marks each will be conducted** and the average marks of the best two tests out of the three tests will be taken.
3. The I test will be based on the first 1.5 units of the syllabus, the II test will be based on the next 1.5 units of the syllabus and the III test will be based on the next 1.5 units of the syllabus.
4. Two assignments for Undergraduate, Certificate, Diploma and Advanced Diploma Courses and **two assignments OR two seminars for Postgraduate Courses.**
5. The duration and the pattern of question paper for practical examination may be decided by the respective Boards of Studies. However, out of **60 marks in the semester practical examination, 10 marks may be allotted for record and 50 marks for practical.**
6. **Three internal practical tests** of 25 marks each will be conducted for science students in the **even semester** and the best two out of the three will be taken. The total 50 marks of best two tests will be converted to 30 by using the following formula:

$$\left(\begin{array}{c}\text{Marks secured in the first best Practical Test (Out of 25)} \\ + \\ \text{Marks secured in the next best Practical Test (out of 25)}\end{array}\right) \text{X } 0.6$$

7. The Heads of Science Departments are requested to keep a record of attendance of practicals for students to assign marks for regularity.

QUESTION PAPER PATTERN FOR CIA TEST (THEORY)

Duration: 1 Hr **Maximum Marks: 20**

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	2 Questions - 2 mark each	2 x 2 = 4
B	Internal choice (Either or type) Answer should not exceed 200 words	2 Questions - 4 marks each	2 x 4 = 8
C	Open Choice (Answer ANY ONE out of Two) Answer should not exceed 400 words	1 Question - 8 marks each	1 x 8 = 8
		TOTAL	**20 MARKS**

QUESTION PAPER PATTERN FOR SEMESTER EXAMINATION (THEORY)

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

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	10 Questions - 2 marks each (2 Questions from each unit)	10 x 2 = 20
B	Internal choice (Either or type) Answer should not exceed 200 words	5 Questions with internal choice. Each carries 5 marks (Two questions from each unit)	5 x 5 = 25
C	Open Choice (Answer ANY THREE out of FIVE) Answer should not exceed 400 words	3 Questions out of 5 - 10 marks each (1 Question from each unit)	3 x 10 = 30
		TOTAL	**75 MARKS**