PERIYAR UNIVERSITY SALEM - 636 011



B.Sc. PHYSICS

CBCS

REGULATIONS AND SYLLABUS

(Effective from the academic year 2008 - 2009 and thereafter)

PERIYAR UNIVERSITY, SALEM - 11 REGULATIONS

1. Eligibility:

Candidates seeking admission to first year of the Bachelor of Science -Physics shall be required to have passed the Higher secondary examination with Mathematics, Physics and Chemistry conducted by the Government of Tamilnadu or an examination accepted as equivalent thereto by the Syndicate subject to the conditions as may be prescribed thereto are permitted to appear and qualify for B.Sc., (Physics) degree examination of this University after a course of study of three academic years.

2. Duration of the Course:

The course for the degree of Bachelor of Science shall consist of three years divided into six semesters with internal assessment under choice based credit system.

3. Course of Study:

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

I SEMESTER

- 1. Language I (Tamil etc)
- 2. English I
- 3. Core Physics I (Mechanics)
- 4. Allied Mathematics I
- 5. Value Education

II SEMESTER

- 6. Language II (Tamil etc)
- 7. English II
- 8. Core Physics II (Thermal Physics)
- 9. Core Physics Practical I
- 10. Allied Mathematics II
- 11. Allied Mathematics III

- 12. Environmental Studies
- 13. Skill based Elective Course I (Programming in C language)

III SEMESTER

- 14. Language III (Tamil etc)
- 15. English III
- 16. Core Physics III (Properties of matter and Sound)
- 17. Allied Chemistry I
- 18. Skill based Elective Course II (Space Science)
- 19. Non Major Elective Course I (Essentials of Electricity)

IV SEMESTER

- 20. Language IV (Tamil etc)
- 21. English IV
- 22. Core Physics IV (Optics)
- 23. Core Physics Practical II
- 24. Allied Chemistry II
- 25. Allied Chemistry II Practical
- 26. Non Major Elective Course II (Physics in Everyday Life)

V SEMESTER

- 27. Core Physics V (Electricity)
- 28. Core Physics VI (Basic Electronics and Digital Electronics)
- 29. Core Physics Elective I
- 30. Core Physics Elective II
- 31. SBEC III (Bio medical Instrumentation)
- 32. SBEC IV (Electronic Devices)

VI SEMESTER

- 33. Core Physics VII (Atomic Physics)
- 34. Core Physics VIII (Nuclear Physics)
- 35. Core Physics IX (Quantum Mechanics and Relativity)
- 36. Core Physics Elective III
- 37. Core Physics Practical III

- 38. Core Physics Practical IV
- 39. SBEC V (Electrical Appliances)
- 40. SBEC VI (Microprocessor and its applications)

Electives (Any three of the following)

- 1. Numerical Methods
- 2. Solid State Physics
- 3. Electrical Mechins and Measuring Instruments
- 4. Energy Physics
- 5. Laser and Spectroscopy
- 6. Electronics and Communication

Skill Based Elective Courses

- 1. SBEC I Programming in C language
- 2. SBEC II Space Science
- 3. SBEC III Bio Medical Instrumentation
- 4. SBEC -IV Electronic Devices
- 5. SBEC V Electrical Appliances
- 6. SBEC VI Microprocessor and its Application

4. Examinations:

The theory examination shall be three hours duration to each paper at the end of each semester. The candidates failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

5. Scheme of Examinations:

The scheme of examination of different semester shall be as follows.

B.Sc., Physics Course Structure under choice Based Credit System

		No. of				Marks	
Part	Course	hours per week	Exam hours	Credi t	Interna 1	Externa 1	Tota 1
		I Se	mester				
Ι	Tamil or any other language Paper - I	6	3	3	25	75	100
II	English Paper - I	6	3	3	25	75	100
	Core - I Physics Paper - I	5	3	5	25	75	100
	Core Physics Practical Paper - I	3	-	-	-	-	-
	Allied I Maths - Paper I	5	3	4	25	75	100
	Allied I Maths - Paper II* (Or)	2	3	-	-	-	-
	Allied - I Chemistry Paper - I	5	3	4	25	75	100
	Allied I Chemistry Practical*	2	3	-	-	-	-
IV	Value Education	2	3	2	25	75	100
	Environmental Studies*	1	-	-	-	-	-

For Students admitted from 2008 - 2009 onwards

* Exam at the end of II Semester

		II S	emester	•			
Ι	Tamil or other language paper II	6	3	3	25	75	100
II	English Paper II	6	3	3	25	75	100
III	Core Physics Paper II	5	3	5	25	75	100
	Core Physics Practical I		3	4	40	60	100
	Allied I Mathematics Paper - II	2	3	4	25	75	100
	Allied I Maths - (Or) Paper III	5	3	2	25	75	100
	Allied I Chemistry Paper - II	5	3	4	25	75	100

	Allied I Practical	2	3	2	40	60	100
IV	Environmental Studies	1	3	2	25	75	100
	Skill Based Elective Course I	2	3	2	25	75	100

Total Credit for I & II Semester = 42 Credits

		No. of				Marks	
Part	Course	hours per week	Exam hours	Credi t	Interna 1	Externa 1	Tota 1
		III Se	emester				
Ι	Tamil or any other language Paper - III	6	3	3	25	75	100
II	English Paper - III	6	3	3	25	75	100
III	Core - Physics Paper - III	4	5	5	25	75	100
	Core Physics Practical Paper - II	3	3	-	-	-	-
	Allied I Maths - Paper I	5	3	3	25	75	100
	Allied I Maths - Paper II* (Or)	2	3	-	-	-	-
	Allied II Chemistry Theory	5	3	3	25	75	100
	Allied - II Chemistry Practical	2	-	-	-	-	-
IV	Skill Based Elective Course - II	2	3	2	25	75	100
	Non Major Elective Course - I	2	3	2	25	75	100

	IV Semester										
Ι	Tamil or other language paper IV6332575										
II	English Paper IV	6	3	3	25	75	100				
III	Core Physics Paper IV	6	3	5	25	75	100				
	Core Physics Practical II	3	3	4	40	60	100				
	Allied I Mathematics Paper - II	2	3	4	25	75	100				
	Allied I Maths - (Or)	5	3	2	25	75	100				

	Paper III						
	Allied I Chemistry Paper - II	5	3	4	25	75	100
	Allied Practical	2	3	2	40	60	100
IV	Non Major Elective Course - II	2	3	2	25	75	100

Total Credit for III & IV Semester = 41 Credits

		No. of			Marks			
Part	Course	hours per week	Exam hours	Credi t	Interna 1	Externa 1	Tota 1	
		V Se	mester					
III	Core - Physics Paper V	5	3	5	25	75	100	
	Core - Physics Paper VI	5	3	5	25	75	100	
	Core - Physics Practical III	3	3	-	-	-	-	
	Core - Physics Practical - IV	3	3	-	-	-	-	
	Core - Physics Elective I	5	3	5	25	75	100	
	Core - Physics Elective II	5	3	5	25	75	100	
	SBEC - III	2	3	2	25	75	100	
IV	SBEC - IV	2	3	2	25	75	100	

	VI Semester									
III	Core - Physics Paper VII	5	3	5	25	75	100			
	Core - Physics Paper VIII	5	3	5	25	75	100			
	Core Physics Paper IX	5	3	5	25	75	100			
	Core - Physics Practical III	3	3	4	25	75	100			
	Core - Physics Practical - IV	3	3	4	40	60	100			
	Core - Physics Elective III	5	3	5	40	60	100			

IV	SBEC - V	2	3	2	25	75	100
	SBEC - VI	2	3	2	25	75	100
V	Extension Activities			1			

Total Credit for V & VI Semester = 57 Credits

Total Credit for 3 years = 140 Credits.

6. Question Paper Pattern:

Time: 3 Hours

Max Marks: 75

Part A: 10 x 2 = 20

(Answer all questions)

(Two questions from each unit)

Part B: 5 x 5 = 25

(Answer all questions)

(One question from each unit with internal choice)

(In Part B out of total 10 question 4 questions may be

Problem oriented)

Part C: 3 x 10 = 30

(Answer any three questions)

(One question from each unit)

7. Passing Minimum:

Theory

IA	:	25	marks	Passing minimum				
Tests	:	15		IA	(40%)	-	10 marks	
Assignment	:	05		UE	(40%)	-	30 marks	
Attendance	:	05						
Total	:	25	-	Total			40 marks	

UE = 75 marks

Practica	Practical:				Passing minimum						
	IA	=	40 marks	IA	(40%)	-	16 marks				
	UE	=	60 marks	UE	(40%)	-	24marks				
IA = 40				Total		40 ma	rks				
Observa	tion		= 10								
Model E	xam		= 15								
Record S	Submission		= 10								
Attendar	nce		= 5								
Total		= 40									

The Candidate shall be declared to have passed the examination if the candidate secures not less than 40 marks in the University examination in each theory paper. For the practical paper a minimum of 40 marks out of 100 marks in the University examination and the record note book taken together is required to pass the examination. There is no passing minimum for record note book however submission of record note book is a must.

8. Classification of Successful candidates:

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed in First Class.

All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed in First Class with Distinction provide they pass all the examinations prescribed for the course at first appearance.

Candidates who pass all the examinations prescribed for the course in the first attempt and within a period of three academic years from the year of admission to the course alone are eligible for University Ranking.

9. Maximum duration for the completion of UG Program:

The maximum duration for the completion of UG Program shall not exceed twelve semesters.

10. Commencement of this Regulation:

These regulations shall take effect from the academic year 2008 - 09 and thereafter.

10. Transitory Provision:

Candidates who were admitted to the UG course of study before 2008 -09 shall be permitted to appear for the examinations under those regulations for a period for three years i.e. up to and inclusive of the examination of April/May 2012. Thereafter they will be permitted to appear only under regulations then in force.

Subject	Paper	Paper Code
Core	Paper I	
Core	Paper II	
Core	Paper III	
Core	Paper IV	
Core	Paper V	
Core	Paper VI	
Core	Paper VII	
Core	Paper VIII	
Core	Paper IX	
Core	Elective I	
Core	Elective II	
Core	Elective III	
Core	Practical I	
Core	Practical II	
Core	Practical III	
Core	Practical IV	

SUBJECT AND SUBJECT CODES

Skill based Elective Course I Skill based Elective Course II Skill based Elective Course III Skill based Elective Course IV Skill based Elective Course V Skill based Elective Course VI Non Major elective Course I Non Major elective Course II Allied Paper I Allied Paper II Allied Paper III Allied Paper IV Allied Practical I Allied Practical I

PERIYAR UNIVERSITY SALEM – 636 011 CBCS B.Sc., PHYSICS [Semester System]

Effective from the academic year 2008 – 2009 and there after Semester - I Core - I Code: Mechanics

Hours : 5 /wk Internal Marks : 25 Credit Points : 5 External Marks: 75

UNIT: I

Projectile: Range up and down an inclined plane maximum range - two directions of projections for a given velocity and range.

Impulse-Impact: Laws of impact – coefficient of restitution – impact of a smooth sphere on a fixed smooth plane – Direct impact between two smooth spheres – Losses in kinetic energy in direct impact Oblique impact between two smooth spheres.

UNIT: II

SHM: Composition of two SHM's of same period along a straight line and at the right angles to each other Lissajous figures.

Dynamics of Rigid Bodies: Compound pendulum theory condition – for minimum period interchangeability of center of suspension and center of oscillation – g using compound pendulum - Bifilar pendulum – parallel and non – parallel threads.

UNIT: III

Center of gravity: Center of gravity of a solid cone, Solid hemisphere, hollow hemisphere and a tetrahedron.

Friction: Laws of friction - angle of friction – resultant reaction and cone of fiction – equilibrium of a body on an inclined plane under the action of a force.

UNIT: IV

Center of pressure: Definition – center of pressure of a rectangular lamina and triangular lamina.

Hydrodynamics: equation of continuity of flow – Bernoulli's theorem – venturimeter – Pitot tube.

UNIT: V

Classical Mechanics: Mechanics of system of particlesconservation theorem for angular momentum and energyconstraints – classification generalized coordinates – transformation equations – principle of virtual work–D' Alembert's principle – derivation of Lagrangian formulation of conservation theorems – generalized momentum – energy and linear momentum.

Books for Study:

- 1. Mechanics and Mathematical Methods by R. Murugesan. S.Chand and Co.
- 2. Dynamics by M. Narayanamurthi and M. Nagarathnam The National Publishing Company
- 3. Statics, Hydrostatics and Hydrodynamics By Narayanamurthi and M. Nagarathnam The National Publishing Company

Books for Reference:

- 1. Classical Mechanics by H. Goldstein Addition Wesley Publications
- 2. Mechanics by D.S. Mathur, S. Chand and Co.,

Semester - II Core - II Code: THERMAL PHYSICS

Hours : 5 / wk Internal Marks : 25 Credit Points: 5 External Marks : 75

UNIT I: THERMOMETRY AND CALORIMETRY:

Platinum resistance thermometer - correction - advantages - definition of Specific heat capacity - determination of Specific heat by Newton's law of cooling - two specific heat capacities of a gas - determination of C_v by Joly's Differential Steam Calorimeter - determination of C_p by Regnault's method.

UNIT II: LOW TEMPERATURE PHYSICS:

Joule - Thomson effect - Porous plug - theory experiment - liquification of gases - air - by - Linde's process - Helium by K. Onnes method. - Helium I and Helium II - Adiabatic Demagnetisation - practical applications of low temperature - electro flux refrigerator - air conditioning machines.

UNIT III : THERMODYNAMICS :

Zeroth, first and second law's of thermodynamics reversible and irreversible processes - heat engines - Carnot's petrol and diesel engines - their efficiency - entropy - change in entropy in reversible and irreversible processes - Third law of thermodynamics - Temperature - entropy diagram.

UNIT IV : CONDUCTION AND RADIATION :

Thermal Conductivity - definition - thermal conductivity of a bad conductor - Lee's disc method - good conductor - Seale's method - radiation -Blackbody radiation - definition.

- Wien's Displacement law - Rayleigh Jean's law - Planck's law - Stepan's law and experimental verification of Stepan's law - Solar constant - temperature of the sun - by Angstrom's Phrheliometer.

UNIT V : MAXWELL'S THERMODYNAMIC RELATIONS :

Derivation of Maxwell's thermodynamic relation - Helmholtz function -Gibb's function - Enthalpy - T ds equation - clausius - clapeyron's latest heat equation - specific heat relation.

TEXT BOOK :

- Brijlal and Subramaniam, Heat and Thermodynamics,
 S. Chand & Co, New Delhi 2004.
- D. S. Mathur, Heat and Thermodynamics,
 S. Chand & Co, New Delhi 2004.

BOOKS FOR REFERENCE :

- J. B. Rajam and C. L. Arora, Heat and Thermodynamics, S. Chand & Co, New Delhi 2004.
- A. B. Gupta and H. Roy, Thermal Physics, Allied Books, New Delhi 2002

SEMESTER - II PHYSICS CORE PRACTICALS – I (Any Sixteen Only)

Hours : 3 / wk Internal Marks : 40

Credit Points: 4 External Marks : 60

- 1. Young's Modulus Non uniform Bending pin and microscope method
- 2. Young's Modulus non uniform bending scale and telescope method
- 3. Torsion pendulum dynamic method Rigidity Modulus
- 4. Surface tension and interfacial surface tension Drop Weight method
- 5. Compound pendulum
- 6. Sonometer frequency of a fork
- 7. Sonometer R.D of a solid and liquid
- 8. Specific heat capacity of a liquid Method of a mixtures Barton's correction

- 9. Spectrometer dispersive power of the prism
- 10. Spectrometer Grating normal incidence measurement of Wavelength
- 11. Potentiometer calibration of low range Voltmeter
- 12. Potentiometer Internal resistance of a cell
- 13. P.O. Box Temperature coefficient of resistance
- 14. Joule's calorimeter Specific heat capacity of a liquid Barton's correction
- 15. Current and Voltage sensitivities of a galvanometer
- 16. Copper Voltameter B_H determination
- 17. Zener diode Voltage regulator
- 18. Low range power pack using two diodes

SEMESTER - II

SYLLABUS FOR ENVIRONMENTAL STUDIES

For Undergraduate Courses of all Branches of Higher Education

Unit - 1:

The Multidisciplinary nature of environmental

studies (2 lectures)

Definition, scope and importance - Need for public awareness

Unit - 2:

Natural Resources:

Renewable and non - renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over - exploitation,

de forestation, case studies.

Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over - utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems.

- c) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
- d) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- e) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

•Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems

(8 lectures)

- Concept of an ecosystem
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristics features, structure and function of the following ecosystem:-
- a) forest ecosystem
- b) Grassland ecosystem
- c) Desert ecosystem
- Aquatic ecosystem (ponds, streams, lakes, rivers, oceans and estuaries)

Unit - 4: Biodiversity and conservation (6 lectures)

• Introduction - Definition: genetic, species and ecosystem diversity.

- Biographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega diversity nation
- Hot spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution

(8lectures)

Definition Cause, effects and control measures of:-

- a) Air pollution
- b) Water pollution
- c) Soil pollution
- d) Marine pollution
- e) Noise pollution
- f) Thermal pollution
- g) Nuclear pollution
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment

- From Unsustainable Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting. Watershed management

- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environment and waste products
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and Control of Pollution) Act
- Wildlife (Prevention and Control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environment legislation. Public awareness

Unit 7: Human Population and the Environment

- Population growth, variation among nations
- Population explosion Family Welfare Programme
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- role of Information Technology in Environment and human health
- Case Studies.

Unit 8: Field work

- Visit to a local area to document environmental assets river / forest / grassland / hill / mountain
- Study of common plants, insects and birds.

• Study of simple ecosystems - pond, river, hill slopes, ect, (Field work Equal to 5 lecture hours)

Semester - III Core - III Code : PROPERTIES OF MATTER AND SOUND

Hours : 4 / wkCredit Points : 5Internal Marks : 25External Marks : 75

UNIT I : ELASTICITY :

Three types of elastic moduli - poisson's ratio - Bending of beams -Expression for bending moment - Depression of the loaded end of a Canti lever - uniform - non uniform bending - theory - experiment pin and microscope method - work done in uniform bending - Koenigi method - non uniform bending - theory - expression for couple per unit twist - determination of rigidity modulus - Static torsion method with scale and telescope - Torsional oscillation of a body Rigidity modulus by torsion pendulum - with mass.

UNIT II : VISCOSITY :

Coefficient of critical velocity - Poiseullis formula coefficient viscosity -Correction for the formula - determination of coefficient of viscosity by capillary flow method - comparison of viscosities oswald's viscometer - viscosity of a highly viscous liquid - stoki's method for the Coefficient of a highly viscous liquid - variation of viscousity with temperature and pressure - viscousity of gases - Mayer's formula for the rate of flow of a gas through a capillary tube -Rankine's method for the determination of viscosity of a gas.

UNIT III : SURFACE TENSION AND OSMOSIS :

Surface energy - angle of contact and its determination - excess of pressure inside curved surface - formation of drops - Experimental study of variation of Surface tension with temperature - drop weight method of determining surface tension and interfacial surface tension - angle of contact of mercury - Quinck's method - surface tension and vapour pressure osmosis experimental determination of osmosis pressure - Laws of osmosis pressure osmosis and vapour pressure of a solution.

UNIT IV : SOUND :

Theory of free, damped and forced vibration - resonance - Sharpness of resonance - Fourier's theorem - application for Saw tooth wave and square wave. - Sonometer - determination of a.c frequency using sonometer determination of frequency using melde's apparatus.

UNIT V : ULTRASONICS AND ACOUSTICS :

Ultrasonics - Production - Piezo electric method - magneto striction method - detection - properties - application.

Acoustics of buildings - reverberation time - derivation of - Sabine's formula - determination of absorption Coefficient.

BOOKS FOR STUDY :

- Elements of properties of matter by D. S. Mathur S. Chand & Co., (2005)
- Properties of matter by R. Murugesan,
 S. Chand & Co., (2005)
- Properties of matter by Brijlal and N. Subramaniam
 S. Chand & Co., (2005)
- Properties of matter and Acoustics by R. Murugesan
 S. Chand & Co., (2005)
- A Text Book of Sound by N. Subramaniam and Brijlal,
 S. Chand & Co., (2005)

BOOKS FOR REFERENCE :

- Fundamentals of General Properties of Matter, H. R. Gulati, S. Chand & Co., (2005)
- Properties of Matter, Subramania Iyer and Ranga Rajan, Viswanathan Publication (2002)
- A Text Book of Sound (2005), R. L. Saighal,
 S. Chand & Co.,

OPTICS

Hours : 5 / wk		Credit Points : 5
Internal Marks : 25	Core IV	External Marks : 75

UNIT - I ABERRATIONS AND EYE PIECES

Monochromatic aberrations - spherical aberration - methods of minimizing spherical aberration - coma, astigmatism and curvature of field, distortion - Chromatic aberration - the achromatic doublet - Removal of chromatic aberration of a separated doublet - Equivalent focal length of two thin lenses - in contact and out of contact method - Huygen's and Ramsden eyepiece - location of cardinal points - Importance and Determination of velocity of light - Piezoelectric grating method - Kerr cell method.

UNIT - II INTERFERENCE AND INTERFEROMETERS

Coherence - temporal coherence and spatial coherence - Air wedge - test of a surface - Michelson Interferometer - types of fringes - Difference in wavelength of Sodium D₁, D₂ lines and thickness of a thin transparent plate. Multiple beam interference - Febry - Perot interferometer - formation of fringes - Jamin's interferometer - Holography - recording and reconstruction.

UNIT - III DIFFRACTION AND OPTICAL INSTRUMENTS

Fresnel's and Fraunhoffer diffraction - Fresnel's half period zones - area of the half period zones - zone plate - Comparison of zone plate with convex lens - Phase revesal zone plate - Phase contrast microscope - Fraunhoffer diffraction pattern with N slits (diffraction grating) - normal and oblique incidence - absent and ovelapping spectra of diffraction grating - Rayleigh's criterion - Resolving power of a telescope, microscope and grating.

UNIT - IV POLARIZATION

Polarization - Nicol prism polarizer and analyzer - Dichroic Polarizers -Huygen's theroy of double refraction in uniaxial crystals - Double image polarizing prisms - Quarter wave plate, Half wave plate - Babinet's compensator - Plane, elliptically and circularly polarized light - production and detection - Optical activity, analysis of light by Laurent's half shade polarimeter - Concept of LCD.

UNIT - V ELECTROMAGNETIC WAVES

Concept of displacement current - Maxwell's equations (differential and integral forms) - EM waves in free space - velocity of light-energy density of EM wave - poynthing theorem - energy per unit volume - scalar and vector potentials - non - uniqueness of electromagnetic potentials - gauge transformations - coulomb and Lorentz gauge - monochromatic plane waves in vacuum - energy and momentum of EM wave.

Books for Study:

- 1. A text book of Optics N. Subramaniyam and Brij lal, Revised by M.N. Avadhanulu, S. Chand & Co, New Delhi., 2004.
- 2. Optics and spectroscopy R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi., 2006
- 3. Geometrical and Physical Optics P. K. Chakrabarti, New Central Book Agency (P) Ltd, Kolkata., 2005.
- 4. Optics D.R. Khanna and H.R. Gulati, R. Chand & Co, New Delhi., 1979

Books for Reference:

- 1. Optics Eugene Hecht, Fourth Edition, Pearson Education, New Delhi., 2007.
- 2. Fundamentals of Optics Jerkins A Francis and White E Harvey, McGraw Hill Inc., New Delhi, 1976.
- 3. Optical Physics S.G. Lipson, H. Lipson and D.S. Tannhauser, Cambridge University Press. 1995.
- 4. Fundamentals of Optics M.G. Raj, Anmol Publications Pvt. Ltd., New Delhi, 1996.

SEMESTER - IV B.Sc., Physics (CBCS) CORE PRACTICAL - II

Hour: 3 / wk Internal marks: 40

Credit points: 4 External marks: 60

(Any Sixteen Only)

- 1. Young's modulus uniform bending pin and microscope
- 2. Young's modulus uniform bending scale and telescope method
- 3. Torsim pendulum MI and rigidity modulus symmetrical masses
- 4. Coefficient of Viscosity of a liquid graduated burette radius by mercury pellet method.
- 5. Melde's apparatus frequency transverse and longitudinal modes.
- 6. Specific heat capacity of a liquid by cooling verification of Newton's law of cooling.
- 7. Melde's apparatus RD of a solid and liquid.
- 8. Air Wedge thickness of a wire and its insulation.
- 9. Spectrometer grating minimum deviation.
- 10. Potentiometer ammeter calibration.
- 11. Potentiometer Specific resistance.
- 12. M and $B_{\rm H}$ Deflection Magnetometer TAN A and TAN B position.
- 13. Field along the axis of a coil deflection magnetometer.
- 14. Carey Foster's bridge Specific resistance.
- 15. BG Comparison of Capacities.
- 16. BG Comparison of EMF's of two cells.
- 17. Half and Full adder.
- 18. Half and Full subtractor.
- 19. Verification of DeMorgan's theorems.
- 20. OPAMP adder and subtractor IC 741

Semester - V Code : Core – V ELECTRICITY

Hours : 5 / Week Internal Marks : 25 **UNIT - I** Credit : 5 External Marks : 75

Principle of a Capacitor - Energy stored in a Capacitor - Energy density change in energy due to dielectric slab - force of attraction between plates of a charged Capacitor - Capacitance of a Spherical and Cylindrical Capacitors -Types of Capacitors - Electrometers - Kelvin's attracted disc electrometer quadrant electrometer - measurement of potential, ionization current and dielectric constant (Solid)

UNIT - II

Carey Foster Bridge - Theory - temperature Coefficient of resistance potentiometer - measurement of current, voltage and resistance -Thermoelectricity - laws of thermo e.m.f, intermediate metals, intermediate temperature - S. G. Starling method for Peettier effect and Thomson effect -Thermo dynamics of thermo couple - determination of π and σ - Thermoelectric diagrams and its uses.

UNIT - III

Magnetic induction due to a straight Conductor carrying current -Magnetic induction on the axis of a Solenoid - moving coil Ballistic galvanometer - Damping Correction - Determination of absolute capacity of a Condenser - Self - inductance by Anderson's Bridge method - Experimental Determination of mutual inductance - coefficient of coupling - principle, construction, action and working of Ruhmkorff's induction coil.

UNIT - IV

Transient current - Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitance - measurement of high resistance by leakage -Growth and decay of charge in a LCR circuit - condition for the discharge to the oscillatory - frequency of oscillation - Importance in wireless telegraphy.

UNIT - V

Alternating current - peak, average and RMS value of current and voltage form factor - j operator - ac circuit containing resistance and inductance choke coil - ac circuit containing resistance and capacitance - series and parallel resonance circuits - Q factor - power in an ac circuit containing LCR -Wattless current - Transformer - construction, theory, energy loss and uses skin effect - Teslacoil

Books for Study:

- Electricity and Magnetism Brijlal and Subramaniam, S. Chand & Co., (2005)
- 2. Electricity and Magnetism R. Murugesan, S. Chand & Co., (2005)

Books for Reference:

- 1. Electricity and Magnetism D. N. Vasudeva, S. Chand & Co., (2005)
- 2. Electricity and Magnetism- K. K. Tewari, S. Chand & Co., (2005)

Semester - V Code :

Core - VI

BASIC ELECTRONICS AND DIGITAL ELECTRONICS

Hours : 5 / Week Internal Marks : 25 **UNIT - I**

Credit : 5 External Marks : 75

Zener Diode and its breakdown mechanism - circuit analysis of Zener diode - voltage regulator - tunnel diode - varactor diode - Gunn diode - photo diode - LED - Half wave and full wave rectifier and their efficiency calculation -Ripple factor - Hybrid parameters - determination - equivalent circuit - linear circuit - h parameters of a transistor - common emitter mode - Transistor circuit performance - experimental determination - limitation.

UNIT - II

Common - emitter transistor as an amplifier - DC and AC load line analysis - Transistor biasing - stabilization - base resistor method - feed back resistor method - Voltage divider bias method - Construction of JFET - its characteristics and parameters - Common source JFET amplifier - MOSFET -Depletion MOSFET - Enhancement MOSFET - UJT, SCR - Construction, working, V-I characteristics and their application.

UNIT - III

Single Stage transistor amplifier - gain calculation - current amplification analysis (C-E only) - Feed back in amplifier - Voltage gain of feed back amplifier - advantages of negative feed back emitter follower - positive feed back amplifier as an oscillator - Hartley, Colpitt's oscillator - multivibrator - astable, monostable and bistable multivibrator using transistor.

Operational amplifier theory - inverter - non - inverter, adder - subtractor - differentiator and integrator.

UNIT - IV

De- Morgan's Theorems - basic logic gates - universal gates -Introduction to combinational logic - Sum of Product (SOP) - Product of Sum (POS) forms of expression - min terms and max terms - reducing Boolean expression solving Boolean's laws - karnaugh map - karnugh map simplification - incompletely specified function

Half adder - full adder - half subtractor - full subtractor - BCD counter - decoder - encoder - multiplexer - demultiplexer.

UNIT - V

RS flip - flop using NAND gates and NOR gates - clocked R-S flip flops -D flip flop - T flip flop - master flip flop - master slave, J-K flip flop - 3 bit register using flip flop - controlled shift counters - Mod 10 counter - A/D conversion - ring D/A conversion - Successive approximation - binary ladder method.

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Books for Study:

- 1. Basic Electronics (Solid state), B.L. Theraja, S. Chand & Co., (2000)
- 2. Principles of Electronics, Metha, V.K. S. Chand & Co., (2001)
- 3. Digital Principles and Applications, Malvino and Leach, TMH.

Books for Reference:

- 1. Digital Electronics, Avinash Kapoor & Maheswari, Principles and Practice.
- 2. Digital Electronics, A.P. Godse, Technical Publisher, Pune.

Semester - VI Code : Core - VII ATOMIC PHYSICS

Hours : 5 / Week Internal Marks : 25 **UNIT - I** Credit : 5 External Marks : 75

Photoelectric effect - Lenard's method to determine e/m for photoelectrons - Richardson and Compton experiment - relation between photoelectric current and retarding potential - relation between velocity of photoelectrons and frequency of light - failure of electromagnetic theory -Einstein's light quantum hypothesis and photoelectric equation - experimental verification of photoelectric equation - Millikan's experiment.

UNIT - II

Positive ray analysis - Thomson's parabola method - theory - determination of e/m and mass of positive ions - Astons mass spectrograph determination of masses of isotopes - uses of mass spectrographs - separation of isotopes - mass spectrograph method - diffusion method - thermal diffusion method - pressure diffusion method.

UNIT - III

Theory of alpha scattering - Rutherford scattering formula - experimental verification - nature of privileged quantum orbits - Bohr's correspondence principle - effect of motion of nucleus - evidences in favour of Bohr's theory - Determination of critical potential - Davis and Goucher's method - Sommerfield's relativistic atom model -application to fine structure of H α line.

UNIT - IV

Description of vector atom model - quantum numbers associated with vector atom model - coupling schemes - J.J. coupling - LS. coupling application of spatial quantisation - Pauli's exclusion principle - the selection rule - intensity rule - Lande's g factor - Bohr magneton - applications of vector atom model - electron configuration - magnetic dipole due to spin - Stern -Gerlach experiment.

UNIT - V

Spectral terms and notations - fine structure of Sodium D lines - fine structure of H α line - Zeeman effect - Larmor's theorem - Quantum mechanical explanation of normal Zeeman effect - anomalous Zeeman effect of D₁ and D₂ lines of sodium - Paschen - Bach effect - Stark effect.

Books for study:

- 1. Modern Physics by R. Murugesan, S. Chand & Co. (2004)
- 2. Atomic Physics J.B. Rajam, S. Chand & Co. (2004)
- 3. Atomic and Nuclear Physics by N. Subramanyam and Brijlal, S. Chand & co. (2004)

Books for Reference:

- 1. Atomic specra by White (2003), Mc Graw Hill Intl. Book Company
- 2. Atomic and Nuclear Physics by H. Semat and J.R. Albright, Chapman and Hall (2003)
- 3. Atomic and Nuclear Physics by T.A. Littlefields and Thorley, ELBS (2003)
- 4. Atomic and Nuclear Physics by S.N. Ghoshal, S. Chand & Co (2004).

Semester - VI Code :

Core - VIII

NUCLEAR PHYSICS

Hours : 5 / Week Internal Marks : 25 **UNIT - I RADIOACTIVITY**

Credit : 5 External Marks : 75

Laws of successive disintegration - transient - and secular equilibria range of alpha particles - experimental measurement - Geiger - Nuttal Law alpha ray spectra - Gamow's theory of alpha decay and its experimental verification - Beta ray spectra - origin of line and continuous spectrum - fermi's theory of beta decay - K electron capture - Nuclear Isomerism.

UNIT - II NUCLEAR DETECTORS :

Principle and working - solid state detector - proportional Counter -Wilson's cloud chamber - Scintillation counter.

Accelerators :

Synchrocyclotron - Synchrotron - Electron synchrotron - proton synchrotron - Betatron.

UNIT - III ARTIFICIAL TRANSMUTATION :

Rutherford's experiment - Bohr's theory of Nuclear disintegration - Q value equation for a nuclear reaction - threshold energy - types of nuclear reaction - energy balance and the Q value - threshold energy of an endoergic reaction - the cross section for nuclear reaction.

Neutron : Mass, Charge, Decay, Spin and magnetic moment, Neutron diffration, absorption of neutron by matter - neutron sources - detectors - neutron collimator.

UNIT - IV NUCLEAR STRUCTURE

Proton - electron theory - proton - neutron theory - Nuclear size experimental measurement of nuclear radius - neutron interaction method isotope structure method - mirror nuclei method - Nuclear charge -Measurement of nuclear charge by the method of alpha Scattering - Nuclear forces Meson theory of nuclear forces - Nuclear models - liquid drop model weizcker's semi - empirical formula - nuclear shell model.

UNIT - V Nuclear fission, fusion and elementary particles:

Types of nuclear fission - Bohr Wheeler theory - chain reaction - critical size and critical mass - Nuclear fusion - source of stellar energy - carbon -Nitrogen cycle - Proton - proton cycle - Thermo Nuclear reaction - Controlled thermo nuclear reaction - Reactors - plasma. Elementary Particles - types of interaction - classification of elementary particles - particle quantum numbers - baryon number - lepton number - strangeness number - hyper charge isospin quantum number.

Books for Study:

- 1. Modern Physics by R. Murugesan, S.Chand & Co., (2005)
- 2. Atomic Physics by J.B. Rajam, S.Chand & Co., (2005)
- 3. Nuclear Physics by D.C.Tayal, Himalaya Publishing House.

Books for Reference:

- 1. A Source book on Atomic energy by Samuel Glass Stone (2002)
- 2. Atomic and Nuclear Physics by Albright Semat (2003)
- 3. Atomic and Nuclear Physics by Little field and Thorley. ELBS (2002)
- 4. Basic Nuclear Physics and Cosmic rays, B.N. Srivatsava, Pragti Prakasham.

Semester - VI Code :

Core - XI

QUANTUM MECHANICS AND RELATIVITY

Hours : 5 / Week Internal Marks : 25 **UNIT - I WAVE NATURE OF MATTER**

Credit : 5 External Marks : 75

Matter waves - Phase and group velocity - wave packet - expressions for de Broglie wavelength - Davisson and Germer's experiment - G.P. Thomnson experiment - electron microscope.

UNIT - II WAVE MECHANICS

Inadequacy of classical mechanics - basic postulates of wave mechanics -Heisenberg's uncertainity principle - its consequences - Schrodinger's equation - properties of wave function - operator formalism - linear operators - adjoint operators - expectation values - eigen value and eigen function - commutativity and compatibility.

UNIT - III APPLICATION OF WAVE MECHANICS

Application of Schroedinger equation - free particle solution of Schroedinger's equation - particle in a box - barrier penetration problem - linear harmonic oscillator - rigid rotator - hydrogen atom.

UNIT - IV SCATTERING THEORY

Scattering process - differential and total cross section - scattering amplitude centre of mass frame - laboratory frame - reduced mass - transformation from C.M. frame to laboratory frame.

UNIT - V RELATIVITY

Frame of reference - Gallilian transformation - Michelson - Morley experiment postulates of special theory of relativity - Lorentz transformation - length contraction - time dilation - relativity of simultaneity - addition of velocities variation of mass with velocity - mass - energy relation - Minkowsky's four dimensional space - time continuum - four vectors - elementary ideas of general theory of relativity.

Books for Study:

- 1. Modern Physics, R. Murugesan, S.Chand & Co., New Delhi
- 2. Quantum mechanics, V.K. Thangappan, New Age International, New Delhi
- 3. A text book of quantum mechanics, Mathews & Venkatesan, Tata McGraw Hill, New Delhi
- 4. Relativity and quantum mechanics, P.K. Palanisamy, Sitech Pub., Kumbakonam

Books for Reference:

- 1. Quantum mechanics, Ghatak & Loganathan, Macmillan Publications
- 2. Introduction to quantum mechanics, Pauling & Wilson, McGraw hill Co., New York
- 3. Perspective of modern physics, Beiser, McGraw hill Co., New York
- 4. Quantum mechanics, Devanathan

SEMESTER - VI

CORE PRACTICAL - III

Hours : 3 / Week Internal Marks : 40 Credit : 4 External Marks : 60

(Any Sixteen Only)

- 1. Cantilever Young's modulus mirror and Telescope.
- 2. Static torsion Rigidity modulus.
- 3. Coefficient of Viscosity ungraduated burette radius by mercury pellet.
- 4. Kundt's tube Young's modulus Velocity of Sound.
- 5. Lee's disc thermal Conductivity of a bad conductor and emissivity.
- 6. Newton's rings refractive index of a lens.
- 7. Spectrometer i i' curve.
- 8. Spectrometer Small angled Prism.
- 9. Potentiometer Calibration of high range Voltmeter.
- 10. Deflection magnetometer m and $B_{\rm H}$ Tan C position.
- 11. Principle of Multimeter.
- 12. B.G. Charge Sensitivity.
- 13. B.G. Determination of absolute capacity.
- 14. Determination of thermo e.m.f direct method BG
- 15. Bridge rectifier with four diodes.
- 16. FET Characteristics
- 17. UJT Characteristics
- 18. SCR Characteristics
- 19. Hartley Oscillator
- 20. Colpitt's Oscillator

SEMESTER - VI

CORE PRACTICAL - IV

Hours : 3 / Week Internal Marks : 40 Credit : 4 External Marks : 60

(Any Sixteen Only)

- 1. Koenig's method non uniform bending.
- 2. Koenig's method uniform bending.

3. Cantilever - dynamic method.

4. Bifilar pendulum - Parallel threads.

- 5. Thermal Conductivity of a good conductor Forbe's method.
- 6. Newton's rings Refractive index of a liquid.
- 7. Spectrometer dispersive power of a grating.
- 8. Spectrometer Cauchy's constant.
- 9. Potentiometer emf of a thermocouple.
- 10. Field along the axis of a coil vibration magnetometer.
- 11. Carey Foster's bridge temperature Coefficient of resistance.
- 12. BG comparison of capacities De Sauty's bridge.
- 13. BG comparison of mutual inductances.
- 14. BG absolute determination of mutual inductance.
- 15. Astable multivibrator using 555 timer.
- 16. Monostable multivibrator using 555 timer.
- 17. Bistable multivibrator using 555 timer.
- 18. Flip flops using gates.
- 19. RC coupled amplifier single stage.
- 20. Operational amplifier integrator and differentiator.

Elective - I Code : NUMERICAL METHODS

Hours : 5 / wk Internal Marks : 25 Credit Points : 5 External Marks : 75

UNIT - I: MATRICES:

Solution of linear equation – Cramer's rule – characteristics matrix and characteristics equation of a matrix – eigen values and eigen vectors – sub space and null space Diagonalisation of 3 x 3 symmetric matrices.

UNIT – II: BETA AND GAMMA FUNCTIONS:

Fundamental property of gamma functions – the value of gamma and graph of gamma function – transformation of gamma function – different forms of beta function – relation between beta and gamma function – application.

UNIT – III CURVE FITTING:

Principle of least square – fitting a straight line – linear regression – fitting a parabola - fitting an exponential curve.

UNIT – IV: ITERATIVE METHODS:

Solving non – linear equation – bisection method – Successive approxiation – Newton Rapson method – modified Euler's method – Runke – Kutta method (Second and third orders only)

UNIT – V: NUMERICAL INTEGRATION:

General formula – Trapezoidal rule – Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rules – Gaussian quadrature formula.

Books for study:

- Introductory methods of numerical analysis S.S. Sastry, Prentice Hall of India, New Delhi 2000 Edition.
- 2. Numerical methods A. Singaravelu, Meenakshi Agency, Chennai (2001)
- Numerical method in Science and Engineering M.K. Venkataraman, PHI – New Delhi, 1997
- Mechanics and Mathematical methods, R. Murugesan
 S. Chand & Co, New Delhi 1999

Elective - II Code: SOLID STATE PHYSICS

Hours : 5 / Week Internal Marks : 25

Credit : 5 External Marks : 75

UNIT - I : CRYSTAL STRUCTURE:

Crystal lattice - primitive and unit cell - seven classes of crystal - Bravasis lattice - Miller - indices - structure of crystals - simple cubic, hexagonal close packed structure, face centered cubic structure - Body Centered cubic structure, simple cubic structure, Sodium chloride structure, Zinc blende structure, Diamond structure.

UNIT- II : CRYSTALLOGRAPHY AND CRYSTAL IMPERFECTIONS:

X ray Spectrum - Moseley's law diffraction of X-rays by crystals - Bragg's law in one dimension - Experimental method in X-ray diffraction - Laue method, Rotating crystal method - powder photograph method - Von Laue's equation, point defects - line defects - surface - volume defects - Effects of crystal imperfections.

UNIT - III: MAGNETIC PROPERTIES

Different types of magnetic materials - classical theory of diamagnetism (Langevin's theory) - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - Quantum theory of ferromagnetism - Anti ferromagnetism - Ferrites - General properties of super Conductivity - Types of Super conductivity.

UNIT - IV: DIELECTRIC PROPERTIES

Fundamental definition in dielectrics - Different types pf electric polarization -Frequency and temperature effects on polarization - Dielectric loss - Clausius -Mosotti relation - determination of dielectric constant - dielectric breakdown properties of different types of insulating materials.

UNIT - V: MODERN ENGINEERING MATERIALS

Polymers - Ceramics - Super strong materials - cermets high temperature materials - Thermo electric materials - Electrets - Nuclear engineering materials - Plastics metallic glasses - Optical materials - Fiber optic Materials & uses.

Books for Study:

- 1. Introduction to Solid State Physics C. Kittel, John Wiley (2004)
- 2. Material Science M. Arumugam, Anuradha Agencies, (2004)

Books for Reference:

- 1. Materials Science and Engineering Raghavan (2004)
- 2. Introduction to Solids Azaroff (2004)
- 3. Solid State Physics A.J. Deckker (2004)

Elective - III Code: ELECTRICAL MACHINES AND MEASURING INSTRUMENTS

Hours : 5 / Week Internal Marks : 25 Credit : 5 External Marks : 75

UNIT - I : DC GENERATORS AND DC MOTORS

DC generators - magnetization and load characteristics - armature reaction - causes of voltage drop in generators - losses and efficiency application of DC generators. Construction and principle of operation of DC motors- back emf - torque equation - types of motors - characteristics of series, shunt and compound motors - DC starters - types and operation.

UNIT - II: ALTERNATORS AND SINGLE & THREE PHASE MOTORS

Simple alternator - construction and principle - frequency and number of poles - rotating field types - e.m.f equation of an alternator - excitation and exciters. Principle of operation of 3 phase induction motor - production of rotating magnetic field- production of torque - slip frequency - comparison between cage and slip ring induction motors - single phase induction motor methods of starting - split phase motor - capacitor motor.

UNIT - III: TRANSFORMERS

Principle of operation - constructional details - core type, shell type - classification of transformers - emf equation - voltage ratio -

current ratio - transformer on no load - testing of transformer - auto transformer - principle - applications.

Three phase transformer - connections - star - star, delta - delta, star - delta, delta - star - parallel operation of transformers - load sharing - cooling of transformers - protective devices and accessories - losses in a transformer.

UNIT - IV:

DIRECT MEASURMENT OF EMF, CURRENT, POWER AND ENERGY

Ammeters and voltmeters - connecting a circuit - classification of ammeter and voltmeters - moving iron, moving coil, hot wire, electrostatic and induction - application of moving iron and moving coil - power in ac and dc circuits - connecting a wattmeter in a circuit - classification of Wattmeter - dynamometer - induction and electrostatic types - dynamometer wattmeter - construction - direct indicating type meter - induction type single phase and three phase energy meter - construction - principle of operation - theory of working.

UNIT - V: TESTING AND MEASURING INSTRUMENTS

CRO - construction and uses - study of wave forms - measurement of voltage, current and frequency - Multimeter - VTVM - transistor tester.

Books for Study:

- 1. A text book of Electrical technology, B.L. Theraja, S. Chand & Co., New Delhi
- A text book of Electrical technology, A. L. Theraja, S. Chand & Co., New Delhi.
- Principles of Electronics, V.K. Metha,
 S. Chand & Co., New Delhi

Books for Refrence:

- 1. A course in Electrical & Electronic measurement and instrumentation, A.W. Sawhney
- 2. A course in Electrical & Electronic measurement and instrumentation, I.P. Gupta
- 3. Electronic measurement and installation, Copper.

Elective - IV Code : ENERGY PHYSICS

Hours: 5 / wk

Internal Marks: 25

Credit Points : 5 External Marks : 75

UNIT - I: SOLAR ENERGY

Solar constant - Solar radiation at the earth's surface - Beam and diffuse Solar radiation - Solar radiation measurements - Angstrom compensation Pyrheliometer - Solar records - Solar pond - application of Solar ponds - Solar cells - principals - semiconductor fixation - conversion efficiency and power output - Solar functions - Solar cooking - Box type Solar cooker - Solar Green house - Types of Green houses.

UNIT - II: WIND ENERGY

Basic principles of wind energy conversion - wind data and energy estimation - Basic components of a WECS (Wind Energy Conversion System) -Generator Control - Local Control - application of wind energy - energy from tides.

UNIT - III : BIO - MASS ENERGY :

Bioman energy - classification - Biomann Conversion technologies -Thermo chemical conversion - Fermentation - photosynthesis - classification of Biogas plants - Janta Biogas - Plant - Gasification of wood - Ethanol from wood by acid hydrolysis.

UNIT - IV : ENERGY STROAGE :

Lead acid battery - Nickel cadmium battery - High temperature battery -Sodium Sulphur cell - Advantages of Batteries - Hydrogen Storage

UNIT - V: ENERGY CONSERVATION:

Principles of energy conservation - Types of energy audit - Energy conservation Approach Technologies - Co-generation - Gas turbines and diesel engine - Heat pipes - Principle - classification of heat pipes.

Books for study :

- 1. Solar Energy G. D. RAI, 1995 Edition
- 2. Solar Energy S. P. Sulatne TMH Second Edition 1997
- 3. Non Conventional energy Sources G. D. RAI, Fourth Edition reprint 2003, Khanna Publication.
- 4. Solar Energy M. P. Agarwal, S. Chand & Co.,

Elective - V Code : LASER AND SPECTROCOPY

Hours: 5 / wk

Internal Marks: 25

Credit Points : 5

External Marks: 75

UNIT – I: ATOMIC SPECTROCOPY:

Constant deviation spectrometer – Hartmann's formula – fine structure and super fine structure – Solar Spectrum – high resolution Spectroscopy – Lummer – Gehrcke plate – Fabry – Perot etalon application.

UNIT-II: MOLECULAR SPECTROCOPY:

Microwave spectroscopy – theory – pure rotational Spectra of diatomic molecules – rigid rotator – symmetric and asymmetric top molecule – microwave spectrometer – microwave oven.

UNIT-III: LASER PHYSICS:

Laser – spontaneous and stimulated emission – population inversion – laser pumping – Einstein Coefficient resonators – vibrational modes of resonators – control resonators – Q- factor – losses in the cavity – Ruby laser – Helium Neon Laser – CO_2 laser – solid state laser – Application of lasers in industry, medicine and instrumentation – Holography.

UNIT – IV: INFRARED SPECTROSCOPY:

The energy of diatomic molecules – the simple harmonic oscillator – The diatomic vibrating Rotator – the vibration – rotation Spectrum of Carbon Monoxide – Breakdown of the Born Oppenheimer – approximation – the interaction of rotation and vibration – Techniques and Instrumentation – double and single – beam operation.

UNIT - V: RAMAN SPECTRPSCOPY:

Raman effect – classical and Quantum theory – molecular polarizability – Pure rotational Raman Spectra of linear molecules – vibrational Raman Spectra – Structure determination Spectroscopy – Techniques and instrumentation.

Books for study:

- 1. Principles of Optics, D.S. Mathur
- 2. Atomic Physics, J.B. Rajam, S. Chand & Co.,
- Fundamentals of molecular Spectroscopy, Banwell, Tata Mcgraw Hill, New Delhi.
- An Introduction to Laser Theory and application by M.N. Aravamudhan, S.Chand & Co.
- 5. Basic Principles of Spectroscopy Chang Raymond Mc Graw Hill.

Elective - VI Code: ELECTRONIC COMMUNICATION

Hours : 5 / Week Internal Marks : 25 **UNIT - I** Credit : 5 External Marks : 75

Modulation - definition - types of modulation AM, FM, PM - expression for amplitude modulated voltage - Wave form of amplitude modulated wave collector modulation circuit - single side band generation - balanced modulator - AM transmitter - block diagram and explanation - frequency modulation expression for frequency modulated voltage - side bands in FM, AM production by transistor modulator - Comparison of AM, FM, PM.

UNIT - II

Demodulation - definition - Diode detection of AM signals - FM detection - Foster Seely discriminator.

Radio receivers - straight receivers - TRF receivers - super heterodyne receivers - Block diagram - explanation of each stage - FM receivers - Block diagram.

UNIT - III

TV - plumbicon - vidicon - scanning and interlaced scanning - block diagram of TV transmitter and receiver - Colour TV - generation R, G, B signals - Simplified block diagram of colour TV transmitter and receiver - TV transmitting antennas - dipole panel - TV receiving antenna - Yagi antenna log antenna - log periodic antenna.

UNIT - IV

RADAR - principle of radar - Radar equation - radar - transmitting systems - radar antennas - duplexer - radar receivers uses of radar - Opto electronic devices - photoconductive cell - solar cell - phototransistor - LED -LCD construction and working.

UNIT - V

Digital communications - digital technology - fundamentals of data communication systems - characteristics of data transmission circuits - digital codes - error detection and correction - data sets and inter connection - requirements - modern classification - modern interfacing.

Books for Study:

- 1. Hand book of Electronics Gupta & Kumar,PragatiPrakhasan (2005)
- 2. Electronics Communication Systems Kennedy and Davis, TMH

Semester - II Code : SKILL BASED ELECTIVE - I Programming in C Language

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I

Evolution of Computers - Computer generations - History of development of Computers.

UNIT - II

Input unit - output unit - Central Processing Unit - programming languages - Algorithms - flow charts - operating system - Basic principle.

UNIT - III

Basic structure of C - Programs - Constants - Variables - Data type - declaration of variables - defining symbolic constants, operators and expression - Reading a character - Writing a character - formatted input and output statements.

UNIT - IV

Control statements - simple if, if - else - else - if ladder - switching statements - go to statement - Break and continue looping - While-do-for statements - Arrays - user defined functions - string functions - Streat, strcpy, strlen, strcmp - elementary idea.

UNIT - V

Development of algorithm, flow chart and program for the following.

1. Average of a set of numbers

- 2. Area of a triangle
- 3. Sorting a set of numbers in ascending and descending order
- 4. Summing the series of numbers
- 5. Solving the series of numbers.

Books for Study and Reference:

- 1. Programming in ANSI C E. Balagurusamy
- 2. Programming with C By ram Goltfried, Schaum Series
- 3. The Spirit of C Herri Mullish and Hubert Kooper
- 4. C for all S. Thamarai Selvi and R. Murugesan.

Semester - III Code : SKILL BASED ELECTIVE - II SPACE SCIENCE

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I Universe

Planets - interior planets - exterior planets - crust, mantle and core of the earth

- different - region of earth's atmosphere - rotation of the earth - Magnetosphere - Van Allen belts - Aurora.

UNIT - II Comets, Meteors, Asteroids

Composition and structure of comets - periodic comets - salient features of asteroids, Meteors and its use.

UNIT - III Sun

Structure of photosphere, chromosphere, corona - sunspots - solar flares - solar prominences - solar piages - satellites of planets - structure, phases and their features of moon.

UNIT - IV Stars

Constellations - Binary stars - their origin and types star clusters - Globular clusters - types of variable stars - types of galaxies.

UNIT - V Origin of Universe

Big bang theory - pulsating theory - steady state theory - composition of universe expansion.

Reference :

- K.D. Abyankar, Astrophysics of the solar system, University press, India
- Baidyanath Basu, An introduction to Astrophysics, Prentice Hall of India, New Delhi.
- 3. Prof. P. Devadas, The fascinating Astronomy, Published by Devadas Telescopies, 2, Charkrapani Road, Guindy, Chennai

Semester - V Code : SKILL BASED ELECTIVE - III BIO - MEDICAL INSTRUMENTATION

Hours : 2 / Week Internal Marks : 25

Credit : 2 External Marks : 75

UNIT - I

Electro - Cardiography (ECG) - Electromyography (EMG) - Electro - Encephelograph (EEG) - Phonocardiography.

UNIT - II

Pacemakers - Introduction - External and Internal pacemakers - Artificial heart valves - (Principle - block diagram and operation).

UNIT - III

Anesthesia machine - Recording fetal heart movements and blood circulation using Doppler ultrasonic method - Laser based Doppler blood flow meter -Blood cell counter - B.P. measurement - Direct and indirect method -Haemocytometer - counting of RBCs and WBCs.

UNIT - IV

Radiation safety instrumentation - Effects of radiation exposure - Radiation monitoring instruments - Pocket dosimeter - pocket type radiation alarm.

UNIT - V

Area monitoring instruments - physiological effects due to current passage - micro shock and macro shock - Electrical Accidents in hospital - Micro shock hazards - macro shock hazards.

Books for Study and Reference:

Bio-medical Instrumentation - Dr. M. Arumugam - Anuradha Agencies.
 Bio instrumentation - John G. Webster, editor - John Wiley & Sons, Inc

3. Biological Instrumentation and methodology, P.K. Bajpai.

Semester - V Code : SKILL BASED ELECTIVE - IV ELECTRONIC DEVICES

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I TRANSMITTERS AND RECEIVERS

Modulation - amplitude, frequency and phase modulations - their theories sidebands in amplitude modulation - transmitters - demodulation - detectors for AM wave - frequency discriminator for FM wave - Super heterodyne receiver - block diagram abone.

UNIT - II TV AND RADAR

Principles of television - iconscope, image orthicon, vidicon - scanning systems - vision characteristics - general concepts of TV transmission and reception basis of colour TV - qualitative study of TV antennas and feeders.

UNIT - III OP-AMP BASIS

The basic op-amp and its characteristics - differential amplifier - CMRR - virtual ground - inverting and non - inverting amplifier - op - amp as adder and subtractor scalar - differentiator - integrator.

UNIT - IV FABRICATION OF INTEGRATED CIRCUITS

Basic monolithic IC - epitaxial growth, masking and etching - fabrication of monolithic and hybrid integrated circuits - fabrication of IC components - resistors, capacitors, diodes and transistors.

UNIT - V ELECTRONIC INSTRUMENTS

Transistor voltmeter (FET) - integrated type - digital frequency meter - recorders - classification X-Y records - strip chart records - working and application.

Books for Study:

1. Integrated Electronics- Millman and Halkias - McGraw Hill Co.

2. Electronic devices and circuits - Allen Mottershed (PHI)

3. Electronic and Radio Engineering - E.E. Terman

4. Introduction to Electronics - A. Ambrose & T. Vincent Devaraj

Books for Reference:

1. Handbook of Electronics - Gupta and Kumar

2. Linear OP - Amp applications - Ram & Gaekwad

3. A course in Electrical & Electronic measurement and instrumentation

A.W. Sawhney

Semester - VI Code : SKILL BASED ELECTIVE - V Electrical appliances

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I Heating and Welding

Electric heating - Modes of transfer of heat - Methods of electric heating - resistance heating - Induction heating - High frequency eddy current heating - Dielectric heating.

UNIT - II Heating and Welding

Resistance welding - Electric arc welding - DC and Ac welding equipment -Energy storage welding - Occupational hazards due to chemical reactions -Industrial heating and welding.

UNIT - III Principles of transformers

Principle of operation - Constructional details - Core type, Shell type classification of transformers - EMF equation - Voltage Ratio - Current ratio -Transformer on no-load - Auto transformer - Principle - Applications.

UNIT - IV Applications of transformers

Three phase Transformer - Connections - Star - Star, Star - delta, Delta-star -Parallel operation of transformers - Load sharing - Cooling of transformers -Protective devices and accessories - Loses in transformer.

UNIT - V Domestic appliances

Theory and principle of operation of fans - Wet grinder - Water heater - Electric iron - Refrigerator - Microwave oven.

Books for Study and Reference:

- 1. A text book in Electric power, P.L. Soni, P.V. Gupta & V.S. Bhatnagar
- 2. Utilisation of Electrical Energy, E.O. Taylor, Orient Longman
- Art & Science of Utilisation of Electrical Energy, H. Partas, M/s. Dhanpat Raji & Sons, New Delhi.
- 4. A Course in Electrical Power, J.B. Gupta, M/s. B.D. Jaataris & Sons.
- 5. A text book in Electrical Technology, B.L. Teraja, S. Chand & Co., New Delhi
- 6. A text book in Electrical Technology, A.K. Teraja, S. Chand & Co., New Delhi
- 7. Alternating current machines, Philip Kermp
- 8. Performance and design of A.C. Machines, M.G. Say, ELBS Edn.
- 9. Theory of alternating current Machinery, Alexander Langsdort.

Semester - VI Code : SKILL BASED ELECTIVE - VI Microprocessor and its applications

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I

Microcomputer - microprocessor development - terms related to microprocessor - 8085 microprocessor - architecture.

UNIT - II

8085 - Word length, address registers - block diagram of microprocessor - ALU - accumulator - instruction format - assembly language programming.

UNIT - III

Counter - Stack pointer - internal data bus - addressing modes - instruction set - Mneumonics - Communication with microprocessor - polling and interrupt.

UNIT - IV

Programs for i) 8 bit addition ii) 8 bit subtraction iii) multiplication and division iv) Greatest and smallest number in an array of 8 bit unsigned numbers.

UNIT - V

v) Arranging numbers in ascending and decending order vi) D/A Conversion

vii) A/D Conversion viii) Sum of N numbers ix) bubble sort method

Books for Study:

- 1. P. Mathur, Introduction to Microprocessor, TMH
- 2. Gilmore, Microprocessor principles and Application, TMH

Books for Reference:

- 1. Gaonkar Microprocessor Architecture Programming and application
- 2. A.K. Roy and K.M. Bunchandi -Advanced Microprocessor and peripherals, TMH

Non - Major Electives - I Semester - III Code : Essentials of Electricity

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I

Electrification by friction - Two kinds of electricity - capacitor - principle of condenser - Types of Condensers - Fixed Condenser - Variable Condenser.

UNIT - II

Condenser boxes - Electrolytic Condenser - Guard ring - Condenser - Condenser in series - Condensers in parallel.

UNIT - III

Electric field - potential - Ohm's law - Electrical energy and power - resistance -

Types of resistance - fixed resistance - variable resistance.

UNIT - IV

Colour Codes - resistance in Series - resistance in parallel - kirchaff's law - application to Wheatsotne's Net work.

UNIT - V

Primary cell - Daniel, Lechlanche, Dry cell - Secondary cell - Lead acid, Nickle (Principle only) - Cadmium cell - rechargeable cell.

Books for Study and Reference:

- 1. Electricity and Magnetism N. Nagarathinam and N. Lau
- 2. Electricity and Magnetism S. Ramamoorthi
- 3. Electricity and Magnetism R. Murugesan
- 4. Electricity and Magnetism Brijlal and Subramaniyam

Non - Major Electives - II

Semester - IV Code :

PHYSICS IN EVERYDAY LIFE

Hours : 2 / Week Internal Marks : 25 Credit : 2 External Marks : 75

UNIT - I MECHANICS

Motion, Force and Newton's laws - Momentum - Projectile and Circular motions - Gravitation - Planetary motion and Earth Satellites - Communication satellites - Work, power and Energy - Energy and Environment - rotational motion.

UNIT - II PROPERTIES OF MATTER

Three states of matter - Binding forces - Fluid Pressure and Thrust -Applications - of fluid pressure - Pascal law - Archimedes principle - Capillary action - Bernoulli's Principle - Viscosity.

UNIT - III HEAT AND SOUND

Measurement of heat and temperature - Clinical Thermometer - Heat transfer -Thermos flask - Change of state - Effect of pressure on boiling point and melting point - Heat engines - Steam engine and Diesel engine.

Sound and music - Reverberation - Acoustics of building - Recording and Reproduction of sound in film.

UNIT - IV ELECTRICITY AND MAGNETISM

Colomb's law - Action of points, lightening arrester - Ohm's law - electric power - Electrical safety - Electromagnetic Induction - Faraday's Law - Lenz Law transformers - mariner's compass.

UNIT - V

Light - optical instruments - Camera - Telescope - Microscope - Projector -Nuclear energy - Fission and Fusion - Nuclear power plants - Atom Bomb and Hydrogen Bomb.

Books for Study:

Mechanics

- 1. University Physics, Sears & Zemansky
- 2. Advanced level Physics, Nelkon & Parker
- 3. Electricity and Magnetism, Brijlal and Subramaniam

PAPER – I: ALLIED PHYSICS- I

Hours : 5 / Week Internal Marks : 25 Credit : 4 External Marks : 75

UNIT: I Mechanics

Projectile – range up and down an inclined plane – Impulse and impact – laws of impact coefficient of restitution – direct impact between two spheres – compound pendulum – theory – determination of acceleration due to gravity.

UNIT: II Properties of Matter:

Newton's law of gravitation – determination of gravitational constant – Boy's method – bending of beams – expressions for bending moment – expression for the depression of the free end of the cantilever – uniform and uniform bending – theory and experiment – torsion – expression for couple per unit twist – torsion pendulum – theory – rigidity modulus by static torsion – surface tension and interfacial surface tension drop weight method.

UNIT : III Heat:

Specific heats: Determination of C_p and C_v – Van – der waal's equation – Critical constants and their determination – Expressions for critical constants – Thermal conductivity of a bad conductor – Lee's disc method

Joule – Thomson effect – Porous plug experiment – Theory – Inversion temperature – Boyle temperature – Liquefaction of gases – Helium

UNIT: IV Optics:

Small angled prism – formation of two thin prisms to produce dispersion without deviation and deviation without dispersion – Constant deviation spectroscope – Interference – Air wedge – Thickness of a wire – Jamin's Interferometer – Rayleigh's Interferometer – Polarisation – Specific rotary power and its determination

UNIT: V Electricity

Carey Foster's bridge – Theory – Measurement of resistance – Potentiometer – Low range voltmeter and ammeter calibration – Theory of moving coil Ballistic Galvanometer – Determination of current and voltage sensitivities – Comparison of capacities.

Books for Study and Reference:

- 1. Mechanics and mathematical methods, by R. Murugesan, S. Chand & Co.
- 2. Properties of matter by R. Murugesan, S. Chand & Co.
- 3. Heat and Thermodynamics by Brijlal and Subramaniam, S. Chand & Co
- 4. Optics and Spectoscopy by R. Murugesan, S. Chand & Co.
- 5. Electricity and Magnetism by R. Murugesan, S. Chand & Co.

Paper - II ALLIED PHYSICS

Code :

Hours : 5 / Week Internal Marks : 25 Credit Points : 4 External Marks : 75

UNIT - I Atomic Physics

Vector atom model - Spatial quantization - spinning electron - Quantum numbers associated with vector atom model - Coupling schemes - LS coupling

- jj coupling - Pauli's exclusion principle - Periodic classifications of elements

- example of electron configuration - stern and Gerlach experiment.

UNIT - II: Nuclear Physics and Solid state Physics

Nuclear models - liquid drop model - Semi empirical mass formula - merits and demerits - shell model - evidences.

Nuclear radiation detectors - Ionisation chamber - Geiger Muller Counter - Wilson cloud chamber - Bubble Chamber. Particle accelerators - synchrocyclotron - Betatron

solid state Physics - Bonding in crystals - ionic bond - covalent band - metallic bond - molecular bond - hydrogen bond.

UNIT - III: Spectroscopy

Molecular Spectra - Theory of pure rotational spectrum - origin of vibration - rotation - Spectrum - electronic spectra - Laser Raman Spectroscopy - Resonance spectroscopy - Basic theory of NMR and ESR.

UNIT - IV: Basic Electronics

Semi Conductor Physics - Construction and characteristics of FET, UJT -Multivibrator - astable - monostable - bistable - basic circuits - operational amplifier as - differentiator and integrator.

UNIT - V: Digital Electronics

Binary, Octal, Hexadecimal numbers and their inter conversion - Laws of Boolean algebra - De Morgan's theorems - NAND / NOR as universal blocks karnaugh mapping - pairs - quads - octets - simplification of Boolean expression.

Books for Study:

- 1. Modern Physics, R. Murugesan, S.Chand & Co., Twelfth Edition
- 2. Digital Principles and application, Malvino & Leach, TMH
- 3. Principles of Electronics V.K. Metha, S. Chand & Co.,

Books for Reference:

- 1. Modern Physics, J.B. Rajam, S. Chand & Co
- 2. Hand book of Electronics, Gupta & Kamar, Pragathi Prakashan.

PAPER – III: Allied Physics Practicals

Hours : 2 / Week Internal Marks : 40 Credit : 2 External Marks : 60

- 1. Young's Modulus non uniform bending Scale and Telescope
- 2. Young's Modulus uniform bending Scale and Telescope
- 3. Torsion pendulum rigidity modulus
- 4. Static torsion rigidity modulus
- 5. Surface tension and interfacial surface tension drop weight method
- 6. Specific heat capacity of liquid method of mixtures half time radiation correction
- 7. Lee's disc coefficient of thermal conductivity of a bad conductor
- 8. Sonometer frequency of fork
- 9. Air Wedge thickness of wire
- 10. Newton's rings radius of curvature
- 11. Spectrometer dispersive power of a prism (Angle of the prism given)
- 12. Potentiometer Voltmeter calibration
- 13. Potentiometer Ammeter calibration
- 14. Field along the axis of a coil B_H (Compass box)
- 15. Zener diode characteristics
- 16. Low range power pack using two diodes.

MODEL QUESTION PAPER B.Sc. (Physics) ELECTRICITY

Time: Three Hours

Max: 75 Marks

Answer all the questions

Part - A (10 x 2 = 20 Marks)

- 1. What is a capacitor? State the unit of capacity.
- 2. Give the principle of attracted disc electrometer.
- 3. Give the formula for temperature coefficient of a coil.
- 4. Define thermo electric power.
- 5. Define self inductance of a coil.
- 6. Define coefficient of coupling between two coils.
- 7. What is the resonant frequency?
- 8. Give a short note on wireless telegraphy.
- 9. Distinguish between series and parallel resonance.
- 10. What is skin effect?

Part - B (5 x 5 = 25 Marks)

11. a) Derive the expression for the energy stored in a capacitor.

- b) Derive expression for capacity of cylindrical condenser.
- 12. a) Derive expressions for Peltier and Thomson coefficients.

(Or)

- b) Write a note on thermoelectric diagrams.
- 13. a) Derive expression for the magnetic induction due to a straight conductor carrying current.

(Or)

- b) Derive an expression for self inductance of a long solenoid.
- 14. a) Obtain an expression for the growth of a current in a LR circuit.

(Or)

b) A condenser is charged in a DC source through a resistance of 2 Megohms.

If it takes 0.5 seconds for the charge to reach $\frac{1}{2}$ of it's initial value, what is the capacity of the condenser?

15. a) An alternating emf of 200 Volts and 50Hz is applied to a condenser in series with a 20V, 5W lamp. Find the capacity of the condenser required to run the lamp.

(Or)

b) Derive expression for power in an ac circuit containing LCR.

Part - C ($5 \times 10 = 50$ Marks) Answer any three questions.

- 16. Explain with necessary theory the measurement of large potential difference using attracted disc electrometer.
- 17. Describe a Carey Foster's bridge and explain how it can be used to find the temperature coefficient of resistance.
- 18. Explain with necessary theory measurement of absolute capacity using BG.
- 19. Discuss the growth and decay of current in a CR circuit.
- 20. Derive expression for the maximum current in a series resonance circuit. Find the frequency of oscillation.