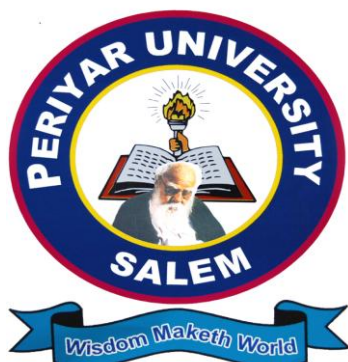


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF BACHELOR OF
SCIENCE
CHOICE BASED CREDIT SYSTEM**

SYLLABUS FOR - B.Sc. PHYSICS

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2012 – 2013 ONWARDS**

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 and Magnetism)
28. Core -Physics -VI (Basic Electronics)
29. Core -Physics -Elective I
30. Core -Physics -Elective II
31. SBEC -III (Bio - Medical Instrumentation)
32. SBEC -IV (Digital Electronics)
33. Core -Physics -VII (Atomic Physics)

VI SEMESTER

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

Semester V : (Any two of the following)

- 1.Numerical Methods
- 2.Solid State Physics
- 3.Applied Physics
4. Energy Physics

Semester VI : (Any one of the following)

- 1.Laser and Spectroscopy
- 2.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 - Digital Electronics
- 5.SBEC -V - Electrical Appliances
- 6.SBEC -VI - Microprocessor and its Application

Non-Major Elective Courses

1. Essentials of Electricity
2. Physics in Every day life

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

For Students admitted from 2012 -2013 onwards

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
I - SEMESTER							
I	Tamil or any other language Paper -I	6	3	3	25	75	100
II	English Paper -I	6	3	3	25	75	100
III	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	-	-	-	-	-

- Exam at the end of II Semester

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
II - SEMESTER							
I	Tamil or any 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	3	4	40	60	100
	Allied I Mathematics Paper -II	2	3	4	25	75	100
	Allied I Maths Paper III (or)	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

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
III - SEMESTER							
I	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 -I Physics Paper -III	4	3	5	25	75	100
	Core Physics Practical Paper -II	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

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
IV - SEMESTER							
I	Tamil or any other language Paper -IV	6	3	3	25	75	100
II	English Paper -IV	6	3	3	25	75	100
III	Core -I Physics Paper - IV	6	3	5	25	75	100
	Core Physics Practical Paper -II	3	3	4	40	60	100
	Allied I Maths -Paper II	2	3	4	25	75	100
	Allied I Maths Paper III (or)	5	3	2	25	75	100
	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

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
V - SEMESTER							
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	-	-	-	-	-
	Physics Practical - IV	3	-	-	-	-	-
	Core - Physics Elective I	5	3	5	25	75	100
	Core - Physics Elective II	5	3	5	25	75	100
IV	SBEC - III	2	3	2	25	75	100
	SBEC - IV	2	3	2	25	75	100

Part	Course	No. of hours / week	Exam hours	Credit	Marks		
					Internal	External	Total
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	40	60	100
	Physics Practical - IV	3	3	4	40	60	100
	Core - Physics Elective III	5	3	5	25	75	100
	Core - Physics Elective II	5	3	5	25	75	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 Maximum Marks : 75

Part A: $10 \times 2 = 20$

(Answer all questions)

(Two questions from each unit)

Part B: $5 \times 5 = 25$

(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: $3 \times 10 = 30$ (Answer

any three questions) (One

question from each unit)

7. Passing Minimum:

Theory:

IA : 25 marks

Passing minimum

Tests : 15 marks IA (40%) - 10 marks

Assignment : 05 marks UE (40%) - 30 marks

Attendance : 05 marks Total - 40 marks

Total : 25 marks

UE : 75 marks

Practical:

		Passing minimum	
IA	: 40 marks	IA (40%)	- 16 marks
UE	: 60 marks	UE (40%)	- 24 marks
IA	: 40 marks	Total	- 40 marks
Observation	: 10 marks		
Model Exam	: 15 marks		
Record Submission	: 10 marks		
Attendance	: 05 marks		
Total	: 40 marks		

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 2012 - 2013 and thereafter.

11. Transitory Provision:

Candidates who were admitted to the UG course of study before 2012 - 2013 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 2015. Thereafter they will be permitted to appear only under regulations then in force.

SUBJECT AND SUBJECT CODES

Subject Paper	Paper
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

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 II

Semester - I

Core - I

Code:

MECHANICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 marks

External Marks : 75 marks

UNIT I

Projectile: Definition of Range, time of flight and angle of projection - 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 – Loss of kinetic energy in direct impact – velocity change in 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 friction – 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 – Bernoullie’s theorem – venturimeter – Pitot’s tube.

UNIT V

Classical Mechanics: Mechanics of system of particles – conservation theorem for angular momentum and energy – constraints and its classification - generalized coordinates – transformation between generalized coordinate and physical coordinates – principle of virtual work – D’Alembert’s principle – derivation of Lagrangian equation of motion from D’Alembert’s principle – Atwood’s machine – conservation theorems using Lagrangian function - generalized momentum, energy, time and linear and angular 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 Addison Wesley Publications
2. Mechanics by D.S. Mathur, S. Chand and Co.,

Semester – II

Core - II

Code:

THERMAL PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

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 and experiment - liquification of gases by Linde's process - Helium by K. Onnes method - properties of Helium I and Helium II - adiabatic demagnetisation - practical applications of low temperature in cryogenic engines and air conditioning machines.

UNIT III

Thermodynamics : Zeroth, first and second laws 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 - Searle'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 Pyrheliometer.

UNIT V

Maxwell's Thermodynamic relations : Derivation of Maxwell's thermodynamic relations - Helmholtz function - Gibb's function - Enthalpy - T-ds equation - Clausius - Clapeyron's Latent heat equation - specific heat relations.

TEXT BOOK :

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

BOOKS FOR REFERENCE :

1. J. B. Rajam and C. L. Arora, Heat and Thermodynamics, S. Chand & Co, New Delhi 2004.

2. A. B. Gupta and H. Roy, Thermal Physics, Allied Books, New Delhi 2002.

3. M.W. Zeemansky and R.H. Diffman, Heat and Thermodynamics, PHI,

12. Lee's Disc – Thermal conductivity of a bad conductor and emissivity.
13. Joule's calorimeter – Specific heat capacity of a liquid – Barton's correction.
14. Current and Voltage sensitivities of a galvanometer.
15. Basic logic gates using IC.
16. Bridge rectifier using four diodes.
17. Low range power pack using two diodes.
18. Specific heat capacity of a liquid – method of mixtures – Half time correction.

Reference books :

1. Practical Physics – Ouseph, Srinivasan & Vijayendran.
2. Practical Physics – P. R. Sasi Kumar, PHI.
3. Advanced Practical Physics – S. P. Singh, Pragathi Prakasam.
4. Practical Physics – St. Joseph College, Trichy.

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.
 - d) 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).

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 - Quincke's method - surface tension and vapour pressure osmosis - experimental determination of osmotic pressure - Laws of osmosis pressure - osmotic and vapour pressure of a solution.

UNIT IV

Sound : Definition of free, damped and forced vibrations – Theory of forced vibrations - 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 : Ultrasonics - Production - Piezo electric method – magneto-striction method - detection - properties - applications.

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

BOOKS FOR STUDY :

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

BOOKS FOR REFERENCE :

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

Semester : IV

Core: IV

Code :

OPTICS

Hours : 6 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT - I

Aberrations : Monochromatic aberrations - spherical aberration - methods of minimizing spherical aberration - Definition of coma, astigmatism and curvature of field, distortion - Method of minimizing spherical aberration ... - 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.

Eye pieces : Huygen's and Ramsden eyepiece - location of cardinal points. Velocity of light - determination of velocity of light - Kerr cell method.

UNIT - II

Interference and Interferometers : Coherence - temporal coherence and spatial coherence - Air wedge - testing the planeness 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 - Feby - Perot interferometer - formation of fringes.

Holography : Holography - recording and reconstruction.

UNIT - III DIFFRACTION AND OPTICAL INSTRUMENTS

Diffraction : Fresnel's and Fraunhofer diffraction - Fresnel's half period zones - area of the half period zones - zone plate - Comparison of zone plate with convex lens - Phase reversal zone plate - Phase contrast microscope - Fraunhofer diffraction pattern with N slits (diffraction grating) - normal incidence - absent and overlapping spectra of diffraction grating.

Optical Instruments : Rayleigh's criterion - Resolving power of a telescope, microscope and grating.

UNIT IV

Polarization : Polarization - Nicol prism as polarizer and analyzer - Dichroic Polarizers - Huygen's theory 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.

UNIT V

Fibre Optics : Introduction – fibre optic system – the fibre optic communication compared to metallic cable (electrical) communication – basic principle – total internal reflection – acceptance angle and numerical aperture – types of optical fibres based on material – propagation (transmission) of light through an optical fibre – index profile – fibre configurations – difference between singlemode fibre and multimode fibre – difference between step index fibre and graded index fibre – fibre optic communication link.

Books for Study:

1. A text book of Optics - N. Subramaniam 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.
5. Engineering Physics - G. Vijayakumari, Vikas Publications.

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 (Any
Sixteen Only)

Hours : 3 /wk

Credit Points : 4

Internal Marks: 40 Marks

External Marks : 60 Marks

01. Young's modulus (q) - uniform bending - pin and microscope.
02. Young's modulus (q) - uniform bending - scale and telescope method.
03. Static Torsion – Rigidity modulus.
04. Torsion Pendulum – Moment of Inertia and Rigidity modulus – symmetrical masses.
05. Coefficient of Viscosity of a liquid - graduated burette - radius by mercury pellet method.
06. Melde's apparatus - frequency - transverse and longitudinal modes.
07. Specific heat capacity of a liquid by cooling - verification of Newton's law of cooling.

08. Air Wedge - thickness of a wire and its insulation.
09. Spectrometer - grating - minimum deviation –
Determination of wavelength of mercury lamp.
10. Potentiometer - ammeter calibration.
11. Potentiometer - Specific resistance of the given coil and
length of second coil without unwinding.
12. M and B_H - Deflection Magnetometer - $TAN A$ and
 $TAN B$ position.
13. Field along the axis of a coil - deflection magnetometer –
determination of B_H .
14. Carey-Foster's bridge - Specific resistance of a coil.
15. BG - Comparison of Capacities.
16. BG - Comparison of EMF's of two cells.
17. Zener diode – Voltage regulator using four diodes and
percentage of regulation.
18. Verification of De Morgan's theorem.

Semester : V

Core : V

Code :

ELECTRICITY AND MAGNETISM

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I

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 Peltier effect and Thomson effect - Thermodynamics of thermocouple - 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 - concept of displacement current - Maxwell's electromagnetic equations in differential and integral form (no derivation).

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 be 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 and uses - energy loss - skin effect - Tesla coil

Books for Study:

1. 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

Core : VI

Code :

BASIC ELECTRONICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I

Special diodes : Light Emitting Diode (LED) and its advantages – multicolor LEDs and its applications - Photo diode – characteristics and applications – Tunnel diode and its characteristics – Tunnel diode as an Oscillator – Varactor diode – Theory and its applications – Shockley diode – PIN diode and its applications.

UNIT – II

Hybrid (h) parameters - determination of h -parameters – h -parameters equivalent circuit – performance of a linear circuit in h -parameter – the h -parameter of a transistor – Nomenclature for transistor h -parameters – input impedance, voltage gain and current gain in h -parameters – experimental determination of h -parameters – limitations of h -parameters.

UNIT - III

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 – IV

Multistage amplifier – definition of gain, frequency response, decibal gain and bandwidth – operation, frequency response, advantage, disadvantage and applications of RC coupled CE transistor amplifier (two stage) and transformer coupled amplifier.

Principle of feedback in amplifiers – positive and negative feedback – effect of negative feedback - emitter follower – positive feedback amplifier as an oscillator - Hartley oscillator, Wien-bridge oscillator and Piezo electric crystal oscillator.

UNIT – V

Multivibrators - astable, monostable and bistable multivibrator using transistor.

Operational Amplifier : Differential amplifier - basic circuit and its operation –CMRR – Op-amp – Block diagram and explanation – applications – differentiator , integrator and comparator – multistage op-amp – solving simultaneous equations.

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. Elements of electronics, M.K. Bagde and S.P. Singh, S. Chand & Co. (1982).

Books for Reference:

1. Foundations of electronics, D. Chattopadhyay and etal., New Age International Publishers (1999).
2. Hand book of Electronics - Gupta & Kumar, Pragati Prakhasan (2005).

Semester : VI

Core : VII

Code :

ATOMIC PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT - I

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 - Aston's 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 spectra 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 : VIII

Core :

NUCLEAR PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT - I : RADIOACTIVITY

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.

Neutron: Mass, charge, decay, spin and magnetic moment, Neutron diffraction, absorption of neutron by matter - neutron sources - detectors - neutron collimator.

UNIT - IV : NUCLEAR STRUCTURE

General properties of nucleus – size , mass and charge.

Proton - electron theory - proton - neutron theory - Nuclear size - experimental measurement of nuclear radius - mirror nuclei method - meson theory of nuclear forces - nuclear models - liquid drop model - Weizacker's semi - empirical formula - nuclear shell model.

UNIT - V : Nuclear fission, fusion and elementary particles

Nuclear fission - Bohr Wheeler theory - chain reaction – critical size and critical mass - Nuclear fission reactor – Nuclear fusion - source of stellar energy - Carbon – Nitrogen cycle - Proton – Proton cycle - Thermo Nuclear reaction – plasma.

Elementary Particles - types of interactions - 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.
5. Concepts of Nuclear Physics, Bernald L. Cohen, TMH.

UNIT IV : APPLICATION OF WAVE MECHANICS IN THREE DIMENSION

Orbital angular momentum (L) - operators and their commutation relations – separation of three dimensional Schroedinger's equation into radial and angular parts – rigid rotator - Hydrogen atom.

UNIT V : RELATIVITY

Frame of reference - Gallilean 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 - Minkowski'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.
5. Quantum Mechanics, G. Aruldass, PHI.

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 - Arthur Beiser, McGraw hill Co., New York.
4. Quantum mechanics - V. Devanathan.
5. Quantum Mechanics in Physics and Chemistry with applications to Biology - Rabi Majumdar, PHI.

- 10.B.G. – Measurement of High resistance by leakage
- 11.Determination of thermo e.m.f - direct method – spot / super sensitive galvanometer.
- 12.FET - Characteristics
- 13.UJT - Characteristics
- 14.SCR - Characteristics
- 15.Hartley Oscillator
- 16.Colpitt's Oscillator
- 17.Half adder and Full adder
- 18.Microprocessor 8085 – Addition and Multiplication

11. BG absolute determination of mutual inductance.
12. Astable multivibrator using 555 timer.
13. Monostable multivibrator using 555 timer.
14. RS - flip flops using NAND / NOR gates.
15. RC coupled amplifier - single stage.
16. Operational amplifier - integrator and differentiator.
17. Microprocessor 8085 – simple subtraction and division.
18. Half subtractor and Full subtractor

Semester : V

Elective: I

Code:

NUMERICAL METHODS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

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 3×3 symmetric matrices.

UNIT II : BETA AND GAMMA FUNCTIONS

Fundamental properties of gamma functions – the value 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 approximation – Newton Rapson method – modified Euler’s method – Runge – Kutta method (second and third orders only)

UNIT V : NUMERICAL INTEGRATION

General formula – Trapezoidal rule – Simpson’s - $1/3$ rd rule and $3/8$ th rule – Gaussian quadrature formula.

Books for study:

1. 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).
3. Numerical method in Science and Engineering – M.K. Venkataraman, PHI – New Delhi, 1997.
4. Mechanics and Mathematical methods, R. Murugesan, S. Chand & Co, New Delhi – 1999.

Semester : V

Elective: II

Code:

SOLID STATE PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I : CRYSTAL STRUCTURE

Crystal lattice - primitive and unit cell – crystal systems – Bravais lattice - Miller indices – Structure of Crystal - Simple Cubic, Body Centered Cubic, Face Centered Cubic and Hexagonal Close Packed structure, Sodium chloride structure, Zinc blende structure and 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's method, rotating crystal method - powder photograph method - point defects – line, surface and volume defects - effects of crystal imperfections.

UNIT III : MAGNETIC PROPERTIES

Different types of magnetic materials (dia- , para- , ferro – and anti-ferro) – Langevin's theory of diamagnetism - Langevin's theory of

paramagnetism - Weiss theory of paramagnetism - quantum theory of ferromagnetism - ferrites - general properties of superconductors - type I & type II superconductors.

UNIT IV : DIELECTRIC PROPERTIES

Fundamental definition in dielectrics - different types of electric polarization - frequency and temperature effects on polarization - dielectric loss - Claussius - 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 - thermoelectric 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).
3. Engineering Physics – G. Vijayakumari, Vikas Publications.

Books for Reference:

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

Semester : V

Elective: III

Code:

APPLIED PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I

Nucleation concept – kinds of nucleation – equilibrium - stability and meta stable state – classical theory of nucleation – kinetic theory of nucleation – energy formation of a nucleus – various crystal growth methods – growth of crystals from solutions – preparation of a solution – saturation and super saturation – low temperature solution growth – slow cooling method – Mason Jar method – evaporation method – crystal from gel – growth of crystals from melt – Bridgmann method.

UNIT II

Nanomaterials – synthesis and classification of synthesis methods – techniques used in synthesis of nanomaterials – Chemical Vapour Deposition, Sol-gel technique, ElectroDeposition method, Ball Milling method – Properties of nano materials and applications

UNIT III

Vacuum - Importance of Vacuum technology in Industry – unit of vacuum – pressure range for low vacuum to ultra-high vacuum.

Pumps : Cenco-hyvac rotating oil pump, Mercury diffusion pump and Turbomolecular pump.

Gauges : Pirani gauge, Penning gauge and McLead gauge.

UNIT IV

Resonance Spectroscopy Techniques : Principle of NMR spectroscopy – spectrometer and simple applications; Principle of NQR spectroscopy – spectrometer and simple applications; Principle of ESR spectroscopy – spectrometer and simple applications; Principle of MossBauer spectroscopy – spectrometer and simple applications.

UNIT V

Biophysics – the basis of biomolecules and molecular system.

Membrane biophysics - nerve cell - bio physical basis of nerve impulse conduction – membrane potential – resting potential and action potential.

Gross bioelectrical phenomenon of ECG and EEG.

Molecular basis of muscle contraction, ultra structure and molecular basis of vision and hearing.

Books for study :

1. Introduction to Nanotechnology – Charles P. Poole Jr, Frank J. Owens, Wiley India.
2. NANO : The Essentials – T. Pradeep, McGraw-Hill Education.
3. Engineering Physics - G. Vijayakumari, Vikas publications.
4. Crystal Growth : Process and Methods - Dr. P. Ramaswamy and P. Santhana Ragavan, Kuru Publications, Kumbakonam.
5. Biophysics – M. V. Volkenshtein, Mir Publications.
6. Biophysics : Concepts and Mechanism – Peter Gray, EW press.
7. Spectroscopy – Straughan and Walker – Vol. I, II and III.
8. Vacuum Science and Technology – V.V. Rao etal - Allied Publishers Ltd.
9. Essentials of Bio-Physics – Narayanan.P – New Age Publications
10. A Text book of Bio-Physics – R.N.Roy – New Central Book Agency (P) Ltd.,

Semester : V

Elective: IV

Code:

ENERGY PHYSICS

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

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 - principle - 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 Wind Energy Conversion System (WECS) - generator control - local control - application of wind energy - energy from tides.

UNIT III : BIO-MASS ENERGY

Biomass energy - classification - Biomass conversion technologies - thermo chemical conversion - fermentation - photosynthesis - classification of biogas plants - Janta bio-gas - plant - gasification of wood - ethanol from wood by acid hydrolysis.

UNIT IV : ENERGY STORAGE

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. Sukhatme, 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.,

Semester : VI

Elective: V

Code:

LASER AND SPECTROSCOPY

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I : ATOMIC SPECTROSCOPY

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

UNIT II : MOLECULAR SPECTROSCOPY

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's coefficient resonators – vibrational modes of resonators – control resonators – Q- factor – losses in the cavity – Ruby laser – Helium Neon Laser – CO₂ 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 - vibrational spectroscopy - techniques and instrumentation.

Books for study and reference :

1. Principles of Optics - D.S. Mathur.
2. Atomic Physics - J.B. Rajam, S. Chand & Co.,
3. Fundamentals of molecular spectroscopy - Banwell, Tata Mcgraw Hill, New Delhi.
4. An introduction to Laser theory and application - M.N. Aravamudhan, S.Chand & Co.

5. Basic principles of spectroscopy – Chang Raymond, Mc Graw Hill.
6. Spectroscopy (Atomic and Molecular) – Gurdeep R. Chatwal etal, Himalaya Publishing House.
7. Laser systems and applications – Nityanand Chowdry and Richa Verma, PHI.
8. Molecular Structure and Spectroscopy – G. Aruldass, PHI.

Semester : VI

Elective: VI

Code:

ELECTRONIC COMMUNICATION

Hours : 5 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT - I

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 and 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, Pragati Prakhasan (2005).
2. Electronics Communication Systems - Kennedy and Davis, TMH.
3. Electronics Communications – Roody Coolen, Pearson Education Publication.
4. Electronics Communications - Frenzel, TMH.

Semester : II

Skill Based Elective : I

Code :

PROGRAMMING IN C LANGUAGE

Hours : 2 /wk

Credit Points : 2

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT - I

Evolution of computers - computer generations - history of development of computers.

UNIT - II

Input unit - output unit - Central Processing Unit (CPU) - 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 - `strcat`, `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 Skill Based Elective : II Code :

SPACE SCIENCE

Hours : 2 /wk Credit Points : 2
Internal Marks: 25 Marks External Marks : 75 Marks

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 :

1. K.D. Abyankar, Astrophysics of the solar system, University press, India.
2. Baidyanath Basu, An introduction to Astrophysics, Prentice Hall of India, New Delhi.
3. Prof. P. Devadas, The fascinating Astronomy, Published by Devadas Telescopes, 2, Charkrapani Road, Guindy, Chennai.
4. Elements of Space Physics – R.P. Singhal, PHI.

Semester : V

Skill Based Elective : III Code :

BIO – MEDICAL INSTRUMENTATION

Hours : 2 /wk

Credit Points : 2

Internal Marks: 25 Marks

External Marks : 75 Marks

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:

1. Bio-medical Instrumentation - Dr. M. Arumugam - Anuradha Agencies.
2. Bio instrumentation - John G. Webster, editor - John Wiley & Sons, Inc.
3. Biological Instrumentation and methodology, P.K. Bajpai.

Semester : V

Skill Based Elective : IV Code :

DIGITAL ELECTRONICS

Hours : 2 /wk

Credit Points : 5

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I

Binary, Octal, Hexadecimal – interconversion – Gray code – excess 3-code – ASCII code – basic gates – DeMorgan’s theorem – universal gates.

UNIT II

Laws of Boolean algebra – solving Boolean expression – K-map-minterms – SOP – K-map simplification using minterm (2, 3 and 4 variables) – POS – K-map simplification using max terms (2, 3 and 4 variables) – incomplete specified functions.

UNIT III

Half adder – Full adder – Half subtractor – Full subtractor – Decoder – BCD to seven segment decoder – Encoder – decimal to BCD encoder – multiplexer – applications – de-multiplexer.

UNIT IV

RS Flip flop using NOR and NAND gates – clocked RS flip flop – D flip flop – JK flip flop – Master Slave JK flip flop – Registers – Shift Registers (right to left and left to right) – applications.

UNIT V

Counters – modulus of a counter – asynchronous counter (4-bits) – synchronous counter (3-bits) – BCD counter – D/A conversion – R-2R binary ladder method – A/D conversion – successive approximation.

Books for study :

1. Digital principles and applications - Malvino and Leach, TMH.
2. Digital fundamentals - Vijayendran, S. Viswanathan Printers and Publishers Pvt. Ltd.,
3. Digital electronics - Virendra Kumar, New Age International Publishers.

Reference Books :

1. Digital electronics - Avinash Kapoor.
2. Principles and Practice of electronics - Maheswari.
3. Digital electronics – A. P. Godse, Technical Publsher, Pune.
4. Digital Logic and Computer Design – Morris Mano, PHI.

Semester : VI Skill Based Elective : V Code:

ELECTRICAL APPLIANCES

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

UNIT I

Electrical charge – current – potential – units – Ohm’s law – electrical energy – power – watt – kWh – consumption of electrical power – resistance – capacitance – inductance and its units – measuring meter Galvanometer, ammeter, voltmeter and multimeter.

UNIT II

Principles of transformers – constructional details – Core type, Shell type – classification of transformers – EMF equation – voltage ratio – current ratio – transformer on no load – auto transformer – applications.

UNIT III

AC and DC – single phase and three phase connections – three phase transformer – house wiring star-star, star-delta, delta –star connections – overloading – earthing – short circuiting – fuses – cooling of transformers – protective devices and accessories – losses in transformer.

UNIT IV

Electrical bulbs – fluorescent lamps – inverter – UPS – Stabilizer – principle and operations of fan – wet grinder – mixer – water heater – electric iron box – microwave oven – refrigerator.

UNIT V

Electric heating – resistance heating – induction heating – high frequency eddy current heating – Dielectric heating – resistance welding – electric arc welding – occupational hazards due to chemical reactions.

Books for study and also for reference :

1. A text book in electric power – P. L. Soni, P.V. Gupta and V.S. Bhatnagar.
2. Utilization of electrical energy – E.O. Taylor, Orient Longman.
3. Arts and Science of utilization of electrical energy – H. Partas, M/s. Dhanpat Raji & Sons, New Delhi.
4. A course in electrical power - J.B. Gupta, M/S. 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 Kermpp
8. Performance and design of A.C. Machines – M.G. Say, ELBS Edn.
9. Theory of alternating current machinery – Alexander Langsdort.

Semester : VI

Skill Based Elective : VI

Code :

MICROPROCESSOR AND ITS APPLICATIONS

Hours : 2 /wk

Credit Points : 2

Internal Marks: 25 Marks

External Marks : 75 Marks

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 - mnemonics - 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 descending order vi) *D/A* conversion vii) *A/D* conversion viii) Sum of *N* numbers ix) bubble sort method.

Books for Study:

1. Introduction to Microprocessor - P. Mathur, TMH.
2. Microprocessor principles and Application - Gilmore, TMH.
3. Fundamentals of Microprocessor 8085 – V. Vijayendran, SV Publication.

Books for Reference:

1. Microprocessor Architecture Programming and application – Gaonkar.
2. Advanced Microprocessor and Peripherals - A.K. Roy and K.M. Bunchandi, TMH.
3. Ten days with 8085 MicroProcessor – K.A. Krishnamurthy, PHI.

Semester : III

Non-Major Elective : I

Code :

ESSENTIALS OF ELECTRICITY

Hours : 2 /wk

Credit Points : 2

Internal Marks: 25 Marks

External Marks : 75 Marks

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 - Kirchoff's law - application to Wheatstone's network.

UNIT V :

Primary cell - Daniel, Lechlanche, Dry cell - Secondary cell - Lead acid, Nickel (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

Semester : IV

Non-Major Elective : II

Code :

PHYSICS IN EVERYDAY LIFE

Hours : 2 /wk

Credit Points : 2

Internal Marks: 25 Marks

External Marks : 75 Marks

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 - 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, lightning arrester - Ohm's law - electric power - electrical safety - electromagnetic induction - Faraday's Law - Lenz Law - transformers - mariner's compass.

UNIT V : OPTICS

Light - optical instruments - camera - telescope - microscope - projector - nuclear energy - fission and fusion - nuclear power plants - atom bomb and hydrogen bomb.

Books for study:

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

Semester : I or III

Allied Physics : I

Code :

PAPER – I

Hours : 5 /wk

Credit Points : 4

Internal Marks: 25 Marks

External Marks : 75 Marks

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. Newton's law of gravitation – determination of gravitational constant – Boy's method.

UNIT II : Properties of Matter:

Bending of beams – expressions for bending moment – expression for the depression of the free end of the cantilever – uniform and non-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 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 –

Polarisation – specific rotatory 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.

Books for Study and Reference:

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

Semester : II or IV Allied Physics : II Code :

PAPER – II

Hours : 5 /wk

Credit Points : 4

Internal Marks: 25 Marks

External Marks : 75 Marks

UNIT I : Atomic Physics

Vector atom model - Spatial quantization - spinning electron – Quantum numbers associated with vector atom model - Coupling schemes - LS and jj coupling - Pauli's exclusion principle - periodic classifications of elements example of electron configuration - Stern and Gerlach experiment.

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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. Particle accelerator – Betatron.

Solid state physics - bonding in crystals - ionic bond - covalent band – metallic bond - molecular bond - hydrogen bond.

UNIT III : Spectroscopy

Basic theory of IR spectrum – single beam experiment – applications – Theory of Raman spectroscopy – vibrational spectrum – applications - electronic spectra - 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 - differentiator and integrator.

UNIT V : Digital Electronics

Binary, Hexadecimal numbers and their inter conversion - Laws of Boolean algebra - De Morgan's theorems - NAND and NOR as universal blocks - 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 /wk

Credit Points : 2

Internal Marks: 40 Marks

External Marks : 60 Marks

List of experiments

- 01.Young's Modulus – non uniform bending – Scale and Telescope.
- 02.Young's Modulus – uniform bending – Scale and Telescope.
- 03.Torsion pendulum – rigidity modulus.
- 04.Static torsion – rigidity modulus.
- 05.Surface tension and interfacial surface tension – drop weight method.
- 06.Specific heat capacity of liquid – method of mixtures – half time radiation correction.
- 07.Lee's disc – coefficient of thermal conductivity of a bad conductor.
- 08.Sonometer – frequency of fork.
- 09.Air Wedge – thickness of wire.
- 10.Newton's rings – radius of curvature.

11. Spectrometer – wavelength of mercury lines – grating – minimum deviation method.
12. Potentiometer – Voltmeter calibration.
13. Potentiometer – Ammeter calibration.
14. Field along the axis of a coil - BH (Compass box).
15. Zener diode – characteristics.
16. Low range power pack – using two diodes.

MODEL QUESTION PAPER

B.Sc. (Physics)

SOLID STATE PHYSICS

Time: 3 Hours

Maximum : 75 Marks

Answer all the questions

Part - A (10 x 2 = 20 Marks)

01. What is Bravais lattice ?.
02. Define space lattice.
03. Define Moseley's law.
04. Calculate the interplanar distance for (3 2 1) plane in simple cubic lattice with interatomic spacing equal to 4.12 \AA .
05. Mention the different types of magnetic materials.
06. What are ferrites?
07. Mention two properties of Dielectric materials.
08. Give the factors causing Dielectric loss.
09. What are polymers?.
10. What are metallic glasses?.

Part - B (5 x 5 = 25 Marks)

11. a) Explain NaCl crystal structure.
(Or)
b) Define atomic radius. Obtain an expression for atomic radius of BCC crystal system.
12. a) State Bragg's law. Obtain expression for it.
(Or)
b) Explain the rotating crystal method of X-ray diffraction.
13. a) Explain the quantum theory of ferromagnetism.
(Or)
b) Discuss the types of superconductors.
14. a) The electronic polarizability of Ar atom is $1.75 \times 10^{-40} \text{ Fm}^2$. Calculate the dielectric constant of solid Ar, using Clausius – Mossotti equation. Its density is $1.8 \times 10^3 \text{ kg m}^{-3}$ (Given atomic weight 39.95).
(Or)
b) What is the effect of frequency on dielectric constant of a material.
15. a) What are nuclear engineering materials. Explain any two different types of materials.
(Or)
b) What are thermoelectric materials and give their applications.

Part - C (5 x 10 = 50 Marks)

Answer any three questions.

16. Describe the structure of HCP crystal. Obtain the relation between c and a .
17. Explain the powder photograph method of X-ray diffraction.
18. Obtain the Langevin's theory of paramagnetism.
19. What is an internal field ?. Obtain an expression for it.
20. What are optical materials and explain their classification.

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