SRI SARADA COLLEGE FOR WOMEN
(AUTONOMOUS), SALEM – 16

Reaccredited with 'B++' Grade by NAAC

(Affiliated to Periyar University)

PG & RESEARCH
DEPARTMENT OF PHYSICS

OUTCOME BASED SYLLABUS

B.Sc. Physics

(For the 2022 – 25 Batch)

B.Sc. PHYSICS

PROGRAMME OUTCOMES

PO1: To understand the basic concepts and analyse for prediction of physical systems.

PO2: To derive several conclusions for the science problems related to public health, safety and environmental issues using the knowledge of physics.

PO3: To apply critical reasoning skills with ethical principles to solve physics related problems with precision and accuracy.

PO4: To equip the students to communicate effectively on interdisciplinary concepts and describe the natural phenomena individually and in teams.

PO5: To prepare the students to create and apply appropriate techniques and modern tools

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM –16
PG & RESEARCH DEPARTMENT OF PHYSICS
B.SC PHYSICS
PROGRAMME STRUCTURE UNDER CBCS
(*For the 2022-25 Batch)*
Total Credits: 140 + Extra Credits (Maximum 28)

I SEMESTER					
Part	**Course**	**Course Title**	**Code**	**Hrs/ week**	**Credits**
I	Language-I	Tamil/ Hindi/ Sanskrit Paper – I	22ULTC1/ 22ULHC1/ 22ULSC1	6	3
II	English-I	Communicative English – I	22ULEC1	6	3
III	Core Course – I	Properties of Matter and Sound	22UPHC1	4	3
III	Core Course – II	Mechanics	22UPHC2	4	3
III	Core Course (Practical)	Core Practical – I	22UPHQC1	2	*
III	Allied Course – I	Allied Chemistry– I	22UPHAC1	3	3
III	Allied Course – I (Practical)	Allied Chemistry Practical	22UPHAQC	2	*
IV	Skill Based – I	Electrical Circuits and Network Skills	22UPHSC1	2	2
V	Society Connect Activity	Group Project based on Society Connect Activity	22USCAC	1	1
	Total			**30**	**18**
VI	• Articulation and Idea Fixation skills • Physical Fitness Practice – 35 Hours per semester • Advanced diploma course in Renewable energy management and Audit Level- 1: Certificate Course 100 hours per year				

II SEMESTER					
Part	**Course**	**Course Title**	**Code**	**Hrs/ week**	**Credits**
I	Language-II	Tamil/ Hindi/ Sanskrit Paper – II	22ULTC2/ 22ULHC2/ 22ULSC2	6	3
II	English-II	Communicative English – II	22ULEC2	6	3
III	Core Course – III	Thermal Physics	22UPHC3	4	3
III	Core Course – IV	Atomic Physics	22UPHC4	3	3
III	Core Course (Practical)	Core Practical – I	22UPHQC1	2	2
III	Allied Course – I	Allied Chemistry – II	22UPHAC2	3	3
III	Allied Course – I (Practical)	Allied Chemistry Practical	22UPHAQC	2	2+2
IV	Skill Based – II	Basic Instrumentation Skills	22UPHSC2	2	2
IV	EVS	Environmental studies	22UEVSC	2	1
		Group Project based on Environmental Studies	22UEVSPC		1

	Total	**30**	**25**
VI	• Articulation and Idea Fixation skills – 1 extra credit • Physical Fitness Practice – 35 Hours per semester – 1 extra credit • Certificate Course in Yoga – 30 hours – 1 Extra Credit • Advanced diploma course in Renewable energy management and Audit Level- 1: Certificate Course 100 hours per year- 2 Extra Credits • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL Extra *Credits:5*		

III SEMESTER					
Part	**Course**	**Course Title**	**Code**	**Hrs/ week**	**Credits**
I	Language-III	Tamil/ Hindi/ Sanskrit Paper – III	22ULTC3/ 22ULHC3/ 22ULSC3	6	3
II	English	Communicative English – III	22ULEC3	6	3
III	Core Course – V	Optics	22UPHC5	3	3
III	Core Course – VI	Medical Physics	22UPHC6	3	3
III	Core Course (Practical)	Core Practical – II	22UPHQC2	3	*
III	Allied Course – II	Allied Mathematics – I	22UPHAC3	5	5
IV	Skill Based – III	Physics Workshop Skills	22UPHSC3	2	2
IV	Non-Major Elective – I			2	2
	Total			**30**	**21**
VI	Society Connect Activity	Group Project based on Society Connect Activity			
	Life Skill Course	Course I: Communication Skills		2	2(Extra)
	• Articulation and Idea Fixation skills • Physical Fitness Practice – 35 Hours per semester • Advanced diploma course in Renewable energy management and Audit Level- 2: Diploma Course 100 hours per year • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

Non- Major elective- I For students other than B.Sc Physics	Energy Resources	22UPHNEC1

IV SEMESTER					
Part	**Course**	**Course Title**	**Code**	**Hrs/ week**	**Credits**

I	Language-IV	Tamil/ Hindi/ Sanskrit Paper – IV	22ULTC4/ 22ULHC4/ 22ULSC4	6	3
II	English	Communicative English – IV	22ULEC4	6	3
III	Core Course – VII	Spectroscopy and Laser Physics	22UPHC7	3	3
III	Elective – I	Physics of Nanomaterials/Geo Physics	22UPHEC1/ 22UPHSEC1	3	3
III	Core Course (Practical)	Core Practical – II	22UPHQC2	3	3
III	Allied Course – II	Allied Mathematics – II	22UPHAC4	5	5
IV	Skill Based – IV	Renewable Energy Resources	22UPHSC4	2	2
IV	Non-Major Elective – II			2	2
	Total			**30**	**24**
VI	Society Connect Activity	Group Project based on Society Connect Activity			2(Extra)
	Life Skill Course	Course II: Professional skills		2	2(Extra)
	• Articulation and Idea Fixation skills– 1 extra credit • Physical Fitness Practice – 35 Hours per semester– 1 extra credit • Advanced diploma course in Renewable energy management and Audit Level- 2: Diploma Course -100 hours per year-2 Extra Credits • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL and societal oriented group projects				

Non- Major elective -II For students other than B.Sc Physics	Astrophysics	22UPHNEC2

V SEMESTER					
Part	**Course**	**Course Title**	**Code**	**Hrs/week**	**Credits**
III	Core Course – VIII	Electricity and Magnetism	22UPHC8	6	5
III	Core Course – IX	Analog Electronics	22UPHC9	5	5
III	Core Course – X	Numerical Methods	22UPHC10	5	5
III	Elective – II	Relativity and Quantum Mechanics/ Fundamentals of Microprocessor	22UPHEC2/ 22UPHSEC2	5	5
III	Core Course (Practical)	Core Practical – III	22UPHQC3	3	*
III	Core Course (Practical)	Core Practical – IV	22UPHQC4	3	*
IV	Non-Major Skill based – I			2	2
IV	Value Education	Value Education	22UVENC	1	-
	Total			**30**	**22**

VI	Society Connect Activity	Group Project based on Society Connect Activity			
	Life Skill Course	Course III : Leadership and management skills		2	2 (Extra)
	• Articulation and Idea Fixation skills • Physical Fitness Practice – 35 Hours per semester • Advanced diploma course in Renewable energy management and Audit Level- 3: Advanced Diploma --100 hours per year • Internship Training – 1 Extra Credit • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

Non- Major Skill based- I For students other than B.Sc Physics	Introductory Bio Physics	22UPHNSC1

VI SEMESTER

Part	Course	Course Title	Code	Hrs/ week	Credit
III	Core Course – XI	Solid State Physics	22UPHC11	6	5
III	Core Course – XII	Nuclear Physics	22UPHC12	5	5
III	Core Course – XIII	Mathematical Physics	22UPHC13	5	5
III	Elective – III	Digital Electronics/ Environmental Physics	22UPHEC3/ 22UPHSEC3	5	5
III	Core Course (Practical)	Core Practical – III	22UPHQC3	3	3
III	Core Course (Practical)	Core Practical – IV	22UPHQC4	3	3
IV	Non-Major Skill based – II			2	2
IV	Value Education	Value Education	22UVENC	1	2
	Total			**30**	**30**
VI	Society Connect Activity	Group Project based on Society Connect Activity			2(Extra)
	Life Skill Courses	Course IV: Universal Human Values		2	2 (Extra)
	• Articulation and Idea Fixation Skills – 1 Extra Credit • Physical Fitness Practice – 35 hours per Semester -- 1 Extra Credit • Advanced diploma course in Renewable energy management and Audit Level- 3: Advanced Diploma Course -100 hours per year-2 Extra Credits • Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

Non-Major Skill based -II For students other than B.Sc Physics	Physics in Everyday Life	22UPHNSC2

* ***Examination at the end of the year***

ALLIED PAPERS OFFERED

(For I B.Sc. Mathematics / Chemistry)

Semester – I:	Allied Physics – I	- 22UMAAC1/ 22UCHAC1
Semester – II:	Allied Physics – II	- 22UMAAC2/ 22UCHAC2
Semester – I & II:	Allied Physics Practical	- 22UMAAQC/ 22UCHAQC

(For II B.Sc. Home Science)

Semester – III:	Allied Physics – I	- 22UHSAC3
Semester – IV:	Allied Physics – II	- 22UHSAC4
Semester – III & IV:	Allied Physics Practical	- 22UHSAQC2

Programme Title : B.Sc. Physics
Course Title : PROPERTIES OF MATTER AND SOUND Hours/Week : 4
Course Code : 22UPHC1 Credits : 3
Semester : I

Course Objective:

This paper helps the students to understand the basic properties of solids, liquids and gases and also the concepts of sound.

SYLLABUS

UNIT – I (Hours: 12)

ELASTICITY

Definition of three moduli of elasticity and Poisson's ratio – relations connecting them – Theoretical limits to the valueof σ - Torsional couple per unit twist in a wire – Work done in stretching and twisting a wire – Period of Torsional Oscillations – Rigidity modulus and moment of inertia by torsional oscillation with and without masses – Internal bending moment – Expression for the depression at the loaded end of a cantilever – Uniform and non-uniform bending (pin and microscope method with theory) – q by Koenig's method –non-uniform bending – I form girders.

UNIT – II (Hours: 12)

SURFACE TENSION

Surface tension and surface energy - The effect of gravity and surface tension on the formation of drops – Excess of pressure inside a curved surface – application to cylindrical and spherical drops and bubbles – Variation of Surface Tension with Temperature by Jaeger's Method - Theory of capillarity – Determination of surface tension by capillary rise method with theory – Definition of angle of contact –Surface tension and angle of contact by Quincke's method-Interfacial tension and surface tension by dropweight.

UNIT – III (Hours: 12)

VISCOSITY

Coefficient of Viscosity – Stream lined and turbulent motion – Critical velocity – Derivation of Poisseulle's formula – correction for pressure head and length of the tube – Comparison of viscosities by Ostwald's Viscometer – Searle's viscometer – Meyer's formula for the viscosity of gases – Rankine's method of determination of viscosity of a gas.

UNIT –IV (Hours: 12)

SOUND

VIBRATIONS IN STRINGS AND AIR COLUMNS

Velocity of transverse waves along a stretched string – Laws of transverse vibrations of string – Vibrations of air columns – Resonance – Velocity of sound in air by resonance method - Organ pipe – Closed end organ pipe – Open end organ pipe – Experimental demonstration of nodes and antinodes in organ pipes – Musical sound and noise – Speech – Human voice – Human ear – Characteristics of musical sound – Intensity of sound – Measurement of intensity of sound: Decibel and Phon – Bel – Phon.

UNIT – V (Hours: 12)

ACOUSTICS

Acoustics of buildings – Reverberation – Sabine's formula – derivation – Determination of absorption coefficient – Sound distribution in an auditorium.

ULTRASONICS

Production (Magnetostriction and Electrostriction generator) – Detection– Acoustic grating – Properties of Ultrasonics – Application of Ultrasonics (In Communication, Industry, Scientific and Medical).

Book for Study:

1. Properties of matter by R. Murugeshan, S.Chand & Co (2012).
2. Sound by Brijlal and N.Subrahmanyam, S.Chand & Co (2018).

Books for Reference:

1. Properties of matter by Brijlal and N.Subrahmanyam, S.Chand & Co(2005).
2. Sound by Brijlal and N.Subrahmanyam, S.Chand & Co.(2005).
3. Elements of properties of matter by D.S.Mathur, S.Chand & Co.(2005).
4. David Halliday and Robert Resnick, Fundamentals of physics, Wiley Plus,(2013).
5. H.R.Gulati, Fundamentals of General Properties of Matter, S.Chand & Co. Pvt. Ltd,(2012).
6. Hugh D.Young and Roger A.Freedman, Sears & Zemansky's University Physics with Modern Physics, 14th Edition (2015).

Web Resources:

1. www.cpalms.org>public>preview
2. http://www.teacher created.com>lessons

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall and recognize** the physical properties of different states of matter and sound.	K_1
CO2	**Apply** the concepts of elasticity, surface tension, viscosity and acoustics to solve problems.	K_3
CO3	**Analyze** the characteristics of sound and the requisites of good acoustics.	K_4
CO4	**Analyze** the applications of ultrasonic's in various fields.	K_3
CO5	**Determine** the elastic constants, surface tension, viscosity and frequency of vibration	K_4

K_6-Create; K_5-Evaluate; K_4-Analyse; K_3-Apply; K_2-Understand; K_1-Recall

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO1	S	M	M	M	M
CO2	S	M	S	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	M	M

Programme Title : B.Sc. Physics
Course Title : MECHANICS **Hours/Week : 4**
Course Code : 22UPHC2 **Credits : 3**
Semester : I

Course Objective:

The aim of the course is to describe the basic laws concerning the motion of bodies under forces and to apply these laws to a range of problems including collisions, Dynamics of rigid body, Centre of Pressure, hydrostatics and hydrodynamics.

SYLLABUS

UNIT –I (Hours: 12)

LAWS OF MOTION

Newton's laws of motion – Force- Impulse of a force - Laws of conservation of energy , linear momentum and angular momentum - potential energy - conservative and non-conservative forces - potential energy curve.

Collision – Elastic and inelastic collision – (Fundamental laws of impact) – Newton's law of impact – coefficient of restitution - Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact.

Unit II: (Hours: 12)

CENTRAL FORCE MOTION

Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for a acceleration of a body rolling down an inclined body without slipping - center of mass –velocity and acceleration of centre of mass – determination of motion of individual particle– system of variable mass-Rocket motion – Satellite.

Unit III: (Hours: 12)

DYNAMICS OF RIGID BODY Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes –

Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k.

Unit IV: (Hours: 12)

GRAVITATION

Newton's law of gravitation – Kepler's law of gravitation – G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth - Value of g at poles and equator- Escape velocity

Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside).

Unit V : (Hours: 12)

HYDROSTATICS AND HYDRODYNAMICS

Friction-laws of friction-angle of friction-cone of friction-Centre of gravity-solid and hollow tetrahedron-solid and hollow hemisphere -Thrust on plane surface - center of pressure-rectangle- Triangular lamina with its vertex on the surface and with one side on the surface – Floating bodies – Laws of floatation – Metacentre – stability of floating bodies – Metacentric height of a ship – Variation of atmospheric pressure with altitude - application of Bernoulli's theorem: Toricelli's theorem –Pitot tube.

Books for Study

1. Properties of Matter by R.Murugeshan and S.Chand, (2014)
2. Dynamics by M.Narayanamurti and N. Nagarathnam, National Publishing company (2008).

Books for Reference

1. Mechanics and Relativity by BrijlalSubramaniam, S.Chand Publications (2010).
2. Fundamentals of Physics by Halliday,Resnic and Walker,Wiley India Pvt Ltd (2008)
3. Mechanics and Mathematical Physics by R.MurugesanS.Chand& Co. (2008).
4. Mechanics by D.C.Tayal, Himalaya Publishing House, First Edition,(2013)
5. Mechanics by D.S.Mathur, S.Chand& Co. (2001)

Web Resources

1. https://bookboon.com/en/physics-ebooks

2. https://houseofphy.blogspot.in/ B.Sc. Physics Mechanics Notes (HRK) By Muhammad Ali Malik

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the laws involved in mechanics.	K_1
CO2	**Explain** the phenomena of motion of bodies and its properties.	K_2
CO3	**Apply** the laws of mechanics to solve simple problems.	K_3
CO4	**Examine** the properties on motion of bodies.	K_4
CO5	**Analyse** the application of hydrostatics and hydrodynamics.	K_4

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title : CORE PRACTICAL – I
Course Code : 22UPHQC1 **Hours/Week : 2**
Semester : I & II **Credits :2**

Course Objective:

The aim of the course is to gain practical knowledge by applying the experimental methods to correlate with the Physics theory and to learn the usage of electrical and optical systems for various measurements and enable the students to explore the concepts involved in the thermodynamics, sound, properties of matter, heat and to understand the fundamentals of instruments involved.

SYLLABUS **Total hours: 60**

Students are expected to perform at least 13 experiments out of the following list.

1. Young's modulus – Non uniform Bending – Optic lever and Telescope.
2. Coefficient of viscosity of a liquid Capillary flow - Radius by mercury pellet –graduatedburette method.
3. Surface tension and interfacial surface tension - Drop weight method.
4. Specific heat capacity of solid by the method of mixtures – Half time correction.
5. Thermal conductivity of a bad conductor - Lee's disc
6. Sonometer - Frequency of Tuning fork
7. Sonometer - AC frequency (Steel and Brass wire)
8. Potentiometer – Calibration of Voltmeter (low range)
9. Potentiometer – Calibration of ammeter
10. Focal length of long focus convex lens U-V method, Conjugate foci method and combinationmethod.
11. Spectrometer – Refractive index - Solid prism.

12. Basic Logic gates – AND and OR using diodes and NOT using transistor.
13. Study of AND, OR and NOT gates using IC.
14. Characteristics of Zener diode.
15. Verification of Truth table NAND,NOR,XOR gates using IC 7400,IC 7402,7486.
16. Young's Modulus-Non-Uniform Bending Pin and Microscope
17. Air Wedge-Thickness of thin wire

Books for Study:

1. Practical Physics and Electronics - C.C.Ouseph, U.J.Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., 2007.
2. Practical Physics, Prof.A.Ponnusamy and B.Amalanathan, Bright Publishers, 1996.

Books for Reference:

1. A text book of Practical Physics – M.N.Srinivasan and others, Sultan Chand and Sons, 2014.

Web Resources

1.https://www.vlab.co.in/broad-area-physical-science

Course Outcomes: On completion of the course, students should be able to

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	S
CO 3	S	M	S	S	S
CO 4	S	S	S	S	S
CO 5	S	S	S	S	S

Programme Title : I B.Sc. Maths / Chemistry & II B.Sc., Home Science
Course Title : ALLIED PHYSICS -I Hours/Week : 3
Course Code : 22UMAAC1/22UCHAC1 & 22UHSAC3 Credits : 3
Semester : I(I B.Sc. Maths / Chemistry) & Semester :III (II B.Sc. Home Science)

SYLLABUS

UNIT-I ELASTICITY (9 Hours)

Young's modulus- Rigidity modulus – Bulk Modulus – Poisson's ratio (definition alone) – Bending of beams – Expression for bending moment – Determination of Young's modulus – Uniform and Non-uniform bending – Torsional oscillations of a body –Expression for couple per unit twist-work done in twisting a wire -Rigidity modulus of a wire and M.I. of a disc by torsion.

UNIT-II: VISCOSITY AND SURFACE TENSION (9 Hours)

Viscosity

Viscosity – Viscous force – Co-efficient of viscosity – units and dimension – Poiseuilles formula for co-efficient of viscosity of liquid – determination of co-efficient of viscosity using burette and Oswald's viscometer.

Surface Tension

Definition - Units and dimension – Molecular theory- Surface tension of a liquid by drop weight method.

UNIT-III: CONDUCTION, CONVECTION AND RADIATION (9 Hours)

Specific heat capacity of solids and liquids – Newton's law of cooling Specific heat capacity of liquid by cooling – Thermal conduction – Co-efficient of thermal conductivity of a bad conductor by Lee's disc method.

Lapse rate – Greenhouse effect – Blackbody radiation – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation (No derivations).

UNIT-IV: OPTICS (9 Hours)

Interference – conditions for interference maxima and minima – Air wedge – thickness of thin wire – Newton's rings – determination of wavelength using Newton's Rings.

Diffraction – Difference between diffraction and interference – theory of transmission grating - Normal incidence.-optical activity –Biot's laws-Specific rotatory power –determination of specific rotatory power using half shade polarimeter.

UNIT-V: SOUND (9 Hours)

Laws of stretched strings – Sonometer - Determination of frequency of a tuning fork – Determination of frequency of alternating current - Ultrasonics– Properties -Piezo-electric effect –Production of ultrasonics wave - Piezo-electric oscillator - applications.

Books for Study

1. Allied Physics, R.Murughesan, S.Chand& Co., (2005).
2. Ancillary Physics, A. Ponnusamy

Books for Reference

1. Engineering Physics, Palanisamy P. K. SCITECH Publications (2011).
2. Sound, M. Narayanamurti, N. Gosakan and T. Rajagopalan, The National Publishing Co, Madras, First Edition, (1978).
3. Ancillary Physics, Kamalakannan and others, S. Viswanathan, (2000).
4. A Textbook of Allied Physics, Dr.Sabesan (2002).

Web Resources

1. https://physics.info/elasticity/
2. https://en.wikipedia.org/wiki/Thermal_conductivity
3. https://sciencedemonstrations.fas.harvard.edu/presentations/sonometer

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic concepts light, Properties of matter, sound and heat.	K_1
CO2	**Summarize** the basic principles of elasticity, viscosity, Surface tension, transport of heat, physical optics and sound	K_2
CO3	**Apply** the basic concepts of physics	K_3
CO4	**Distinguish** between various modes of heat transfer.	K_4
CO5	**Deduce** the various parameters in light, properties of matter, sound and heat based on theory.	K_5

Programme Title : I B.Sc. Maths / Chemistry & II B.Sc., Home Science
Course Title : ALLIED PHYSICS PRACTICAL
Course Code : 22UMAAQC/22UCHAQC & 22UHSAQC2 **Hours/Week : 2**
Semester : I & II / III & IV **Credits : 2 + 2**

Course Objective:

The aim of the course is to develop practical skills in mechanical, electrical, heat and optics experiments.

SYLLABUS **Total hours :60**

Students are expected to perform at least 12 experiments out of following list.

1. Young's modulus – Non-Uniform Bending – Scale and Telescope.
2. Surface tension and interfacial surface tension - Drop weight method.
3. Rigidity modulus of a wire - Torsion Pendulum.
4. Sonometer – Frequency of tuning fork.
5. Potentiometer – Low range voltmeter (0-3V).
6. Study of logic gates - AND, OR, NOT using IC.
7. Zener diode characteristics.
8. Thermal conductivity of a bad conductor by Lee's disc method.
9. Specific heat capacity of liquid – method of mixtures – half time correction.
10. Potentiometer – Ammeter calibration.
11. Sonometer – Determination of AC frequency.
12. Spectrometer – Refractive index of Solid Prism (A , D and μ).
13. Rigidity modulus of a rod – Static Torsion.
14. Young's modulus -Non Uniform bending -Pin and Microscope method
15. Verification of truth table NAND, NOR and XOR Gates using IC 7400, IC 7402 and IC 7486.
16. Coefficient of viscosity of a liquid - capillary flow method

Books for Study

1. Practical Physics and Electronics - C.C.Ouseph, U.J.Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., (2007).
1. Practical Physics, Prof.A.Ponnusamy and B.Amalanathan, Bright Publishers, (1996).

Books for Reference

1. A text book of Practical Physics – M.N.Srinivasan and others, Sultan Chand and Sons, (2014).

Web Resources

1. *www.practicalphysics.org/*

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the usage of travelling microscope, Vernier caliper, screw gauge	K_1
CO2	**Demonstrate** the working principle of logic circuits	K_2
CO3	**Apply** the theory of heat, light, electricity and sound to laboratory experiments to arrive solutions to physical problems	K_3
CO4	**Analyze** the physical principle involved in various instruments	K_4

Programme Title : B.Sc. Physics
Course Title : SKILL BASED-I : ELECTRICAL CIRCUITS AND NETWORK SKILLS
Course Code : 22UPHSC1 **Hours/Week : 2**
Semester : I **Credits : 2**

Course Objective:

The aim of the course is to enable the students to design and trouble shoots the electrical circuits for practical applications.

SYLLABUS

Unit-I (Hours: 6)

BASIC ELECTRICITY PRINCIPLES

Fundamentals of Electricity - Current, Volt, Resistance - Ohm's Law - Power -Kilowatt Hour - Capacitance -Inductance -Electrical Charge -Electrical Energy-Electric Potential-Familiarizing Ammeter, Voltmeter and Multimeter- Grouping of Capacitors: Capacitor in Series –Capacitor in Parallel- Capacitor in Series Parallel Combinations.

Unit-II (Hours: 6)

D.C CIRCUITS

Resistance: Series Circuit, Parallel Circuit and Series-Parallel Circuits- Colour Codes- Kirchoff's Law - Application of Wheatstone's Network.

Unit-III (Hours: 6)

AC CIRCUITS

AC Fundamentals- Generation of Alternate emf- Important Terminology- AC Circuit Containing: Resistance, Inductance and Capacitance-Generation of Three Phase Voltage: Star Connection- Delta Connection.

Unit-IV (Hours: 6)

NETWORK THEOREMS

Introduction-Linear and Non-Linear Networks- Network Theorems-Superposition Theorem-Reciprocity Theorem -Thevenin's Theorem-Norton's Theorem.

Unit-V (Hours: 6)

DOMESTIC WIRING

Introduction -Wiring Materials and Accessories -Earthing and Its Necessity-Over Loading –Short Circuiting –Fuses- Circuit Breaker.

Books for Study

1. Electric Circuit Analysis- Prof.T.NageswaraRao, A.R.PUBLICATIONS, (2006)
2. Basic Electrical, Electronics and Communication Engineering – S.ChenthurPandian (2000)
3. Electricity And Magnetism – R. Murugeshan ,S.chand& company ltd.(2001)
4. Basic Electrical and Electronics Engineering, Dr.N.Premkumar, Anuradha Publications Chennai (2012).

Books for Reference

1. Electricity & Magnetism –Brijlal & Subramaniyam, Ratan Prakashan Mandir, Educational & University Publishers, New Delhi, (1987).

Web Resources

1. https://swayam.gov.in/nd1_noc19_ee36/preview

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic principles and laws of electricity	K_1
CO2	**Summarize** the basic concepts in electricity like electrical wiring, ac circuits and earthing	K_2
CO3	**Apply** the concepts of electricity in simple problems	K_3
CO4	**Examine** the given electrical circuits	K_4

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	M	S	S
CO 3	S	S	S	S	M
CO 4	S	S	S	M	M

Programme Title : B.Sc. Physics
Course Title : THERMAL PHYSICS
Course Code : 22UPHC3 **Hours/Week : 4**
Semester : II **Credits : 3**

Course Objective:

The aim of the course is to study the basics of thermodynamics, statistical mechanics, and kinetic theory and to provide a general introduction to each of the core heat-related subjects.

SYLLABUS

Unit-I (Hours: 12)

THERMOMETRY AND CALORIMETRY

Variation of resistance with temperature – Measurement of temperature by Platinum resistance thermometer with theory advantages – Thermistor.Newton's law of cooling – Determination of specific heat of a liquid by cooling – cooling correction – Half time correction – Barton's correction – Definition and determination of C_p and C_v - Regnault's method and Joly's differential steam calorimeter.

Unit-II (Hours: 12)

LOW TEMPERATURE PHYSICS

Latent heat of fusion of ice and steam –Their Determination - effect of pressure on melting point and Boiling Point– Regelation – Super heating and super cooling – Ice line, steam line and Hoarfrost line – Triple point of water.

Porous plug experiment - Joule Kelvin effect – theory and experiment – J.K.effectbelow , at and above Boyle temperature – Temperature of inversion in terms of Vander Waal's constants – Liquefaction of a ir – Linde's process.

Unit-III (Hours: 12)

CONDUCTION AND RADIATION

Thermal conductivity – definition –conductivity of a good conductor by Forbe's method - conductivity of bad conductor by Lee's disc method- Problems

Stefan's law – Experimental verification of Stefan's law – Deduction of Newton's law from Stefan's law – Experimental Determination of Stefan's constant – Lummer and Pringshiem Experiment - Distribution of energy in the spectrum of a black body - Wien's displacement law - Rayleigh – Jean's law and Planck's law – Planck's radiation law derivation – Average energy of Planck's Oscillator.

Unit-IV (Hours: 12)

THERMODYNAMICS

Isothermal and Adiabatic Changes – Reversible and Irreversible Processes-Entropy – concept of entropy – Entropy of a perfect gas - change in entropy during reversible and irreversible process – Problems

-Effeciency of Carnot's Engine-T.S. diagram for Carnot engine- Carnot theorem – Calculation of entropy change in different phases – Law of increase of entropy - Maxwell's thermodynamic relations – Deduction of first and second latent heat equations

Unit-V (Hours: 12)

STATISTICAL MECHANICS

Phase space – micro and macro states - Definition of probability – Classical statistics – Maxwell'sBoltzmann statistics – Difficulty of classical statistics – Quantum statistics – Bose - Einstein statistics – Expression for energy distribution – Fermi – Dirac statistics – Expression for energy distribution (Qualitative study only).

Books for Study

1. Heat and Thermodynamics and Statistical Physics by Brijlal and Subramaniam S. Chand & Co., 2018.
2. Heat by M. Narayanmurthy and M.Nagarathinam, National Publishing Co., Chennai (1987).

Books for Reference

1. Heat by D.S. Mathur, S.Chand& Co. (1978)
2. Text Book of Heat and Thermodynamics by J.B. Rajam and C.L. Arora, S.Chand& Co (2003)
3. Text Book of Heat and Thermodynamics by, Singhal, S.Chand& Co (2003)

Web Resources

1. www.physbot.co.uk/thermal-physics.html

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Define** the basic concepts of thermodynamics and statistical mechanics	K_1
CO2	**Describe** the principles of thermodynamics and statistical mechanics	K_2
CO3	**Apply** the fundamentals of thermodynamics to solve problems	K_3
CO4	**Distinguish** between the theorems of classical and quantum statistics	K_4
CO5	**Interpret** the thermal laws behind the real-life situations	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	**S**	**S**	S	S	M
CO 2	S	S	S	S	S
CO 3	S	S	S	M	S
CO 4	S	S	S	S	M
CO 5	S	S	S	M	S

Programme Title : **B.Sc. Physics**
Course Title : **ATOMIC PHYSICS**
Course Code : **22UPHC4** **Hours/Week : 3**
Semester : **II** **Credits : 3**

Course Objective:

The aim of the course is to provide the basic ideas about the structure of atoms, historical development of atomic theories, evolution of atomic spectra and origin of X-rays.

SYLLABUS

Unit-I (Hours: 9)

THE ELECTRON AND POSITIVE RAYS

Determination of the electronic charge: Millikan's Oil drop method-Discovery - Properties of Positive rays- Bainbridge's Mass spectrograph for determining e/m-Dempster's mass spectrographs –-Uses of mass spectrograph - Mass defect and Packing fraction – Binding energy-Atomic Mass- critical potential - Atomic excitation- Experimental determination of critical potential- Frank and Hertz experiment.

Unit-II (Hours: 9)

STRUCTURE OF THE ATOM

Early atomic spectra - Thomson's model -Rutherford's nuclear atom model - Rutherford's theory of alpha particle scattering -Drawback - Bohr atom model -Bohr's interpretation of the hydrogen spectrum- Effect of nuclear motion on atomic spectra - Evidence in favour of Bohr's theory - Ritz combination principle -Bohr correspondence principle.

Unit-III (Hours: 9)

X-RAYS AND PHOTO ELECTRIC METHOD

Production of X-Rays – Coolidge tube – Properties- X-ray spectra – Continuous and Characteristics – X-ray Spectra-continuous spectra-characteristics spectra – Mosley's law (Statement, Explanation and Importance) –Compton effect–theory and Experimental verification.

Photoelectric effect – Lenard‟s method to determine e/m for photo electrons - Richardson and Compton experiment – Relation between photoelectric current and retarding potential – Relation between velocity of photo electronics and frequency of light–Photo electric cells - Photo emission cell – Photo voltaic cell –Photo conductive cell – Applications

Unit-IV (Hours: 9)

VECTOR ATOM MODEL

Vector atom model – Various quantum numbers - LS and JJ couplings - Pauli's exclusion principle – Magnetic dipole moment of an electron due to orbital and spin motion – Bohr magnetron - Stern- Gerlach

experiment – Optical spectra - Spectral terms and notations - Selection rule – Intensity rule – Interval rule - Fine structure of sodium D lines – Hyperfine structure.

Unit-V(Hours: 9)

INFLUENCE OF ELECTRIC AND MAGNETIC FIELDS

Zeeman effect – Experiment- Larmor's theorem – Debye's Quantum mechanical explanation of normal Zeeman effect – Anamolous Zeeman effect – Theoretical explanation - Lande's g factor and explanation of splitting up of D_1 and D_2 lines of sodium – Paschen-Back effect – Stark effect – Experimental study.

Books for Study

1. Modern Physics – R.Murugesan, S.Chand and Co, (2005).

Books for Reference

1. Atomic Physics – J.B. Rajam., S.Chand and Co, (2005).
2. Advance Atomic Physics - P.K. Das, Campus books international, (2009).

Web Resources

1. https://www.britannica.com/science/atomic-physics
2. https://www2.physics.ox.ac.uk/.../atomic_physics_lecture_notes_c_port_pdf_20824.p...

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the concepts of quantum effects in modern physics from the classical to its modern era.	K_1
CO2	**Apply** quantum mechanics to the study of atoms	K_3
CO3	**Analyse** the different characteristics of X-Rays and its applications	K_4
CO4	**Apply** the concept of photoelectric effect to design the photoelectric devices	K_3, K_6
CO5	**Interpret** the influence of electric and magnetic field on the materials.	K_2

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	M	M	S	M
CO 2	S	S	S	M	M
CO 3	S	S	S	S	S
CO 4	S	S	M	S	S
CO 5	S	M	M	M	S

Programme Title : I B.Sc. Maths / Chemistry & II B.Sc., Home Science
Course Title : ALLIED PHYSICS – II Hours /Week : 3
Course Code : 22UMAAC2/22UCHAC2&22UHSAC4 Credits : 3

Semester :II(I B.Sc. Maths / Chemistry) & Semester :IV(II B.Sc. Home Science)

Course Objective:

To provide knowledge on optics, nuclear physics, electronics, fibre optics and lasers

SYLLABUS

Unit-I (Hours: 9)

ELECTRICITY

Electricity - Ohms law – Law of resistance in series in parallel – Specific resistance –Capacitors - capacitors in series and parallel – Carey -Faster's bridge – measurement of specific resistance - Potentiometer – Principle – Calibration of voltmeter.

Unit-II (Hours: 9)

ATOMIC AND NUCLEAR PHYSICS

Atomic Physics: Vector Atom model – Spatial Quantization – Spinning Electron - Quantum numbers associated with Vector atom model - Pauli's exclusion principle – X-rays – production properties.

Nuclear Physics: Nucleus – Nuclear Properties – Mass defect – Packing Fraction–Binding energy – Liquid Drop Model- Shell model– Radio isotopes – Uses of Radio isotopes – Nuclear fusion and Fission.

Unit-III (Hours: 9)

ANALOG ELECTRONICS

Semiconductor – PN Junction diode – Zener diode – Regulator power supply – Transistor – working of transistor – CE Configuration – current gain relationship between α and β – Transistor characteristics.

Unit-IV (Hours: 9)

DIGITAL ELECTRONICS

Number system – Decimal – Binary – Octal and Hexadecimal System – Binary addition, Subtraction and multiplication- 1's Compliment Method of Subtraction – 2's Complement method of Subtraction– Conversion of one number system to another number system

Basic logic gates – OR, AND, NOT, NOR and NAND gates- Symbols, Logic equations and truth tables – De Morgan's theorem and its verification

Unit-V (Hours: 9) LASER PHYSICS

Stimulated absorption- Spontaneous and stimulated emission –Einstein's co-efficient - Population inversion –Pumping Mechanism - Condition for Laser action-Optical resonator – He-Ne Laser – Ruby Laser - Applications of lasers(Basic Idea).

Books for Study

1. Basic Electrical, Electronics and Communication Engineering by S.ChenthurPandian 2000.
2. Allied physics by R.Murugesan, S.Chand& Company 2008.
3. Modern physics by R.MurugesanS.Chand& Company 2007.
4. Allied Physics paper II, Dr. K. Thangaraj, Dr. D. Jayaraman ,(2004).
5. Allied Physics, Part 2, Kamalakannan and others, S. Viswanathan, (2000).
6. Applied Physics, R. Murughesan, Anuradha Pub., (2008)

Books for Reference

1. Allied Physics, R.Murughesan, S.Chand& Co., 2005.
2. A Textbook of Allied Physics, Dr.Sabesan and et al, - VoI - I and Vol - II, 1998.
3. Ancillary Physics, Kamalakannan and others, S. Viswanathan, 2000.
4. Engineering Physics, M. Arumugam, Anuradha Agencies, Publishers, 2010.
5. A.S.Vasudeva, Modern Engineering Physics, S.Chand and Company Ltd., 1988.
6. Allied Physics, G.Ravichandran, Padmapriya Publications, 2007.
7. Ancillary Physics, A. Ponnusamy and others, Einstein publications, 1998.
8. Engineering Physics, Palanisamy P.K. SCITECH Publications, 2011.
9. V.K. Mehta, Principles of Electronics, S.Chand and Company Ltd., 2009.

Web Resources

1. *https://www.schandpublishing.com/books/.../physics/allied-physics.../ 9788121924443.*

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basics concepts of modern physics, electricity and electronics	K_1
CO2	**Discuss** vector atom model, nuclear properties, theory of semiconductors and lasers	K_2
CO3	**Apply** the concepts of modern physics, lasers and electronics to solve problems	K_3
CO4	**Analyze** the working principles behind laboratory instruments	K_4

Programme Title : **B.Sc. Physics**
Course Title : **SKILL BASED-II : BASIC INSTRUMENTATION SKILLS**
Course Code : **22UPHSC2** **Hours /Week : 2**
Semester : **II** **Credits : 2**

Course Objective:

The aim of the course is to get exposure with various aspects of instruments and their usage through hands-on mode.

SYLLABUS

Unit-I (Hours: 6)

BASICS OF MEASUREMENT

Instruments accuracy- precision-sensitivity- resolution range- Errors in measurements- loading effects- Function of instruments- Electronic versus electrical instruments- Essentials of an instrument - Multimeter- Principles of measurement of dc voltage -dc current-ac voltage-ac current –resistance-multimeter-specifications-significance- Experiment with necessary theory for testing the electronic components such as resistors, diodes, and transistors using multimeter

Unit-II (Hours: 6)

ELECTRONIC VOLTMETER

Advantage over conventional voltmeter – voltage Measurement–sensitivity-Principles of voltage measurement (block diagram only)-Specifications of an electronic Voltmeter/Multimeter –significance- AC millivoltmeter-Block diagram-specifications.

Unit-III (Hours: 6)

CATHODE RAY OSCILLOSCOPE

Block diagram of basic CRO-Construction of CRT-Electron gun- electrostatic focusing- acceleration (no mathematical treatment), brief discussion on screen phosphor-chemical composition. Time base operation-synchronization- Specifications of a CRO – significance- Front panel controls-Experiment with necessary theory for Measurement of voltage, frequency and time period using CRO.

Unit-IV (Hours: 6)

SIGNAL GENERATORS AND ANALYSIS INSTRUMENTS:

Block diagram-explanation- specifications of low frequency signal generators-pulse generator-function generator- Brief idea for testing-specifications - wave analysis. Experiment with necessary theory for Wave form analysis using AFO

Unit-V (Hours: 6)

DIGITAL INSTRUMENTS

Principle and working of digital meters-Comparison of analog &digital instruments-Characteristics of a digital meter-Working principles of digital voltmeter -Digital Multimeter: Block diagram and working .

Experiment with necessary Theory for testing continuity of the circuits using multimeter

Books for Study

1. A text book in Electrical Technology - B L Theraja (2005) - S Chand and Co.
2. Electronic Instrumentation-HS Kalsi, (2012)-Tata McGraw Hill
3. Electrical and electronic measurements and instrumentation engineering-Dr.NilkandaDatta (2009)-Books and allied (P) LTD.

Books for Reference

1. Electronics measurements and Instrumentation, S.Ramachandran, Khanna publishers (2002).
2. Digital instrumentation, A.J. Bowens, TMH (1977).
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Electrical and electronics measurement and instrumentation, A.K.Sawhney, Dhanpat& sons (2000).
5. Logic circuit design, Shimon P. Vingron, 2012, Springer.
6. Digital Electronics, SubrataGhoshal, 2012, Cengage Learning.
7. Electronic Devices and circuits, S. Salivahanan& N. S.Kumar, 3rd Ed., 2012,

Web Resources

1. web.mst.edu/~cottrell/ME240/Resources/basic_inst/Basic_Instrumentation.pdf.
2. http://www.kelm.ftn.uns.ac.rs/literatura/si/pdf.
3. https://www.accessengineeringlibrary.com/browse/electronic-instrument-handbook-third-edition.
4. *web.iitd.ac.in/~janas/courses/ell301.htm*

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Identify** various parameters that are measurable using voltmeter, ammeter, multimeter, CRO and signal generators	K_1
CO2	**Describe** the working principle of different measuring instruments	K_2
CO3	**Apply** the complete knowledge of laboratory instruments to measure the physical quantities	K_3
CO4	**Compare** the working of analog and digital instruments.	K_4

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	M
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO 4	S	M	S	S	S

Programme Title : B.Sc. Physics
Course Title : OPTICS
Course Code : 22UPHC5 **Hours/Week : 3**
Semester : III **Credits : 3**

Course Objective:

The aim of the course is to give the basic ideas and principles of optics, geometrical and physical optics, learn the mathematical techniques employed in physical optics and use these principles and techniques to solve problems in optics.

SYLLABUS

Unit-I (Hours: 9)

GEOMETRICAL OPTICS

Lens– Power of thin lens – Spherical aberration in lenses – Methods of minimizing spherical aberration - Coma – Astigmatism – Chromatic aberration in lenses – condition for achromatism of two thin lenses (in contact) Velocity of light – Houston Piezo electric grating method - Importance of measuring velocity of light.

Unit-II (Hours: 9)

DISPERSION AND DEVIATION

Dispersion – Deviation produced by a thin lens – Dispersive power – Dispersion without deviation and deviation without dispersion – Direct vision spectroscope – Constant deviation spectroscope-comparative study of Huygens's and Ramsden's eyepieces.

Unit-III (Hours: 9)

INTERFERENCE

Conditions for interference –coherence- Fresnel Biprism- Theory of interference fringes – determination of thickness of thin sheet of transparent material - interference due to reflected light (thin films) -colours of thin films –determination of diameter of a thin wire by Air wedge – Test for optical flatness –Michelson's Interferometer – theory and its Application (Measurement of wavelength) – Jamin's interferometer – determination of refractive index of gases.

Unit-IV (Hours: 9)

DIFFRACTION

Fresnel's diffraction –Rectilinear propagation of light – zone plate –action of zone plate - Plane diffraction grating – theory of plane transmission grating - experiment to determine the wavelength (Normal

incidence method) –Resolving power– Rayleigh's criterion for resolution – resolving power of a prism - resolving power of grating.

Unit-V (Hours: 9)

POLARISATION

Double refraction –Nicol Prism – Nicol Prism as polarizer and analyzer – Huygens's explanation of double refraction in uniaxial crystals– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light- Optical activity–Specific rotatory power –Laurent's half shade polarimeter.

Books for Study

1. A Text Book of Optics - N.Subrahmanyam &Brijlal, S.Chand & Company Ltd, Reprint (2002).

Books for Reference

1. Optics - R. Murugesan, S.Chand & Company Ltd, (2010).
2. Optics: Principles and Applications - Kailash K. Sharma, Acadamic Press, (2006).
3. Optics and Spectroscopy - R. Murugeshan, Kiruthiga Sivaprasath, (2005).
4. A text book of Optics - Brijlal, N. Subrahmanyam, S.Chand& Company, Ramnagar, New Delhi, (2005).
5. Fundamentals of Optics - Ashok Kumar, Dr. Khanna, Dr.Gulati R. Chand and Co., (2011).
6. Applied Optics - Devaraj Singh, Laxmi Publications Pvt Ltd., (2010).

Web Resources

1. www.ais.ku.edu.tr
2. www.adelaide.edu.au

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic concepts of optics	K_1
CO2	**Describe** the methods of minimizing aberrations in various optical instruments	K_2
CO3	**Apply** the acquired knowledge of geometrical and wave optics to solve related problems	K_3
CO4	**Compare** the phenomenon of physical optics and wave optics	K_4
CO5	**Interpret** the intensity distribution of light due to polarization, interference and diffraction.	K_5
CO6	**Evaluate** the optical parameters.	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO 4	S	S	S	S	M
CO 5	S	S	S	S	S
CO6	S	S	S	S	M

Programme Title : B.Sc. Physics
Course Title : MEDICAL PHYSICS
Course Code : 22UPHC6 **Hours/Week : 3**
Semester : III **Credits : 3**

Course Objective:

The aim of the course is to enable the students to understand the physics of the body and to familiarize various medical equipments, measurements involved and their technical aspects and safety.

SYLLABUS

Unit-I (Hours: 9)

HUMAN PHYSIOLOGICAL SYSTEMS

Cell and their structure – Transport of ions through cell membrane- Resting and action potential: Characteristics of resting potential –Bio-electric potential –Nerve tissues and organs- Different systems of human body –Skeletal, Circulatory, Respiratory, Digestive, Excretory and Regulatory systems.

Unit-II (Hours: 9)

TRANSDUCERS

Transducers- characteristics of transducer- static and dynamic active transducers – magnetic induction type - piezoelectric type -photovoltaic type- thermoelectric type- Passive transducer- resistive type - capacitive transducer.

Unit-III (Hours: 9)

MEDICAL IMAGING PHYSICS

X-rays- electromagnetic spectrum- Production of X-rays- X-ray spectra- continuous spectra and characteristic spectra- Coolidge tube- Computer Tomography **(**CT**)** principle- Block diagram of CT scanner**.**

Unit-IV (Hours: 9)

BIO-POTENTIAL RECORDER

Introduction-characteristics of recording system-Electrocardiography (ECG)-cardiac cycle-ECG wave form-analysis of ECG signals-Block diagram of ECG-ECG leads –unipolar-bipolar-ECG recording setup- Electromyography **(**EMG**)** – Block diagram- EMG recording setup.

Unit-V (Hours: 9)

RADIATION PHYSICS

Radiation units - exposure-absorbed dose-units: rad-Curie-Roentgen, relative biological effectiveness-interaction of radiation with matter-photoelectric effect-Compton effect (qualitative treatment)-radiation monitoring instruments-pocket dosimeter-pocket type radiation alarm -area monitoring instrument: Ionization chamber-GM counter.

Books for Study

1. Bio-medical Instrumentation – Dr.M.Arumugam – Anuradha Agencies, Kumbakonam, Sixth Reprint (2016).
2. Allied Physics, R.Murughesan, S.Chand & Co., (2017).

Books for Reference

1. Biological Instrumentation and methodology P.K.Bajpai, S.Chand& Co, New Delhi, First Edition (2006).
2. Biological Instrumentation - C.Bhuvaneswari, Anuradha Publications, Chennai, First Edition (2007).
3. Bioanalytical Techniques, M.L.Srivastava, Narosa publishing house (2008).
4. Handbook of Biomedical Instrumentation, R.S.Khandpur, Tata McGraw-Hill publishing company (2009).

Web Resources

1. http://www.freebookcentre.net/Physics/Medical-Physics-Books.html
2. Physics in Medicine University of Notre Dame Online | NA Pages | English
3. https://www.slideshare.net/PrincyRandhawa/biomedical-instrumentation-60215990
4. https://www.accessengineeringlibrary.com/.../handbook-of-biomedical-instrumentation.

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** various functions of human physiological systems to explore its performance as a physical machine	K_1
CO2	**Describe** the concepts behind physiological systems, transducers, medical imaging techniques and recorders.	K_2
CO3	**Apply** fundamental concepts of Physics to understand biomedical instrumentation	K_3
CO4	**Analyse** medical diagnostic techniques to answer a variety of physiological questions	K_4
CO5	**Determine** bio-electric potentials of various biomedical instruments	K_5

Mapping of COs with POs

CO	**PO**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	M	S	M
CO 2	S	S	S	S	S

CO 3	S	S	S	S	S
CO 4	S	S	S	S	S
CO 5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title : CORE PRACTICAL – II
Course Code : 22UPHQC2 **Hours/Week : 3**
Semester : III & IV **Credits : 3**

Course Objective:

The aim of the course is to gain practical knowledge by applying the experimental methods to correlate with the Physics theory and to learn the usage of electrical and optical systems for various measurements and enable the students to explore the concepts involved in the thermodynamics, sound, properties of matter, heat and to understand the fundamentals of instruments involved.

SYLLABUS **Total hours : 90**

1. Young's modulus – Uniform Bending – Pin and Microscope.
2. Compound pendulum.
3. Torsion pendulum with and without masses – Rigidity Modulus and Moment of Inertia.
4. Surface Tension by Capillary rise method.
5. Latent heat of fusion of ice and determination of specific heat of liquid – Half time correction.
6. Focal length of concave lens – Lenses in contact and out of contact.
7. Spectrometer – Refractive index – Hollow prism.
8. Spectrometer – i-d curve.
9. Spectrometer – Grating – Minimum deviation – Wavelength determination.
10. Air wedge – Thickness of a wire.
11. B.G – Comparison of E.M.F. of two cells.
12. BG comparison of Capacitance – Desauty's bridge.

13. Potentiometer – Specific resistance of a wire.

14. Transistor Characteristics – Common Emitter configuration.

15. Regulated power supply using IC (5 Volts).

16. Bifilar Pendulum – Moment of Inertia and verification of Perpendicular axes theorem.

17. Searle's Double bar pendulum – Determination of q, n & σ.

18. Liquid lens – Refractive index of a liquid.

19. Meter Bridge – Specific resistance of the given wire.

Books for Study

1. B.Sc. Practical Physics - C.L.Arora, S.Chand, (1995).
2. Practical Physics and Electronics - C.C.Ouseph, U.J.Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., (2007).
3. A text book of Practical Physics – M.N.Srinivasan and others, Sultan Chand and Sons, (2014).

Books for Reference

1. B.Sc Practical Physics - N.N.Ghosh. Bharat Bawan, (2001).
2. B.Sc Practical Physics - GeetaSanon, R.Chand& Co., (2007).
3. A Text Book of Practical Physics- S. N. Ganguly, K. P. Basu Publishing, (1960).

Web Resources

1. http://www.git.edu

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the skills of experimenting using the laboratory instruments.	K_1
CO2	**Apply** the principles of Physics to the experimental determinations of the results	K_3
CO3	**Analyze** the concepts involved for developing and solving problems.	K_4
CO4	**Evaluate** the experiments in the field of Properties of matter, electricity, optics and electronics	K_5

Mapping of COs with POs

	PO

CO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	S	S	M	S
CO 2	S	M	S	S	M
CO 3	S	S	M	S	M
CO 4	S	S	M	M	S

Programme Title : B.Sc. Physics
Course Title : SKILL BASED – III: PHYSICS WORKSHOP SKILLS
Course Code : 22UPHSC3 **Hours/Week : 2**
Semester : III **Credits : 2**

Course Objective:

The aim of the course is to enable the students to acquire laboratory skills, electrical skill, and mechanical skill measurements and basics concepts involved.

SYLLABUS

Unit-I (Hours: 6)

MEASURING UNITS

Conversion to SI and CGS - Familiarization with meter scale – Vernier Calliper- Screw gauge Measure the dimension of a solid Volume of cylindrical block beaker and glass -Measure the dimension of a solid - Diameter of a thin wire-Thickness of metal sheet- Use of Sextant to measure height of buildings, mountains.

Unit-II (Hours: 6)

MECHANICAL SKILL

Casting– Rolling- Machining - Forming and Welding - Types of Welding joints– Welding defects- Steel copper, iron, metal sheets - Machine tools like lathe– Shaper – Drilling – Milling - Cutting tools- Cutting of a metal sheet using blade - Smoothening of cutting edge of sheet using file - Drilling of holes of different diameter in metal sheet and wooden block.

Unit-III (Hours: 6)

ELECTRICAL SKILL

Soldering of electrical circuits– Series RLC circuit analysis – AC generator - Making regulated power supply - Timer circuit - Electronic switch using transistor – Operation of oscilloscope.

Unit-IV (Hours: 6)

ELECTRONIC SKILL

Electronic Instruments, Multimeter – Vacuum tube voltmeter – Solid state multimeter – Cathode ray oscillograph – Television – Radar – Electron microscope - Masers Problems.

Unit-V (Hours: 6)

INTRODUCTION TO PRIME MOVERS

Mechanism of gear system and wheel - Fixing of gears with motor axel - Lever mechanism - Lifting of heavy weight using lever - braking systems - Working principle of power generation systems.

Books for Study

1. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
2. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
3. Basic-Gear-Mechanisms.

Books for Reference

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edition.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732].

Web Resources

1. https://web.uri.edu/newstudent/files/StudyTipsPhysics.pdf

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Describe** the importance of error analysis needed for measurements.	K_1
CO2	**Discuss** the basic concept of Mechanical, electrical & electronic instruments.	K_2
CO3	**Apply** the knowledge measuring skills in various experimental techniques.	K_3
CO4	**Analyse** the performance of the Mechanical, Electrical and Electronic instruments.	K_4

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**

CO 1	S	S	S	M	M
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO 4	S	S	S	S	S
CO 5	S	M	S	S	S

Programme Title : B.Sc. Physics
Course Title : NME – I: ENERGY RESOURCES
Course Code : 22UPHNEC1 **Hours/Week : 2**
Semester : III **Credits : 2**

Course Objective:

The aim of the course is to cover the wide spectrum of solar radiation and various forms of energy derived from the solar radiation and also explain the various environmental impacts of energy utilization and study various types of conventional and non-conventional energy resources including solid, liquid and gaseous fuels.

SYLLABUS

Unit-I (Hours: 6)

Introduction to energy sources – Primary, secondary and supplementary sources – Energy consumption as a measure of prosperity – Energy sources and their availability – Minor and major sources of energy – Qualitative ideas of coal, oil, gas, organic waste and nuclear power and water power.

Unit-II (Hours: 6)

Solar energy – Solar constant – Units of solar constant – Solar radiation at the earth surface – Beam & diffuse radiation – Sun at zenith – Air mass – Attenuation of beam radiation – Absorption & scattering – Application of solar energy – Hot water supply system.

Unit-III (Hours: 6)

Bio mass energy – Geothermal energy – Wind energy – Ocean thermal energy conversion – Energy from waves and tides (Basic ideas of energies).

Unit-IV (Hours: 6)

Environmental legislation & laws – Water (Prevention and Control of Pollution) Act – Air (Prevention and Control of Pollution) Act – Forest (Conservation) Act – Wildlife (Protection) Act –

Environment (Protection) Act – Issues Involved in Enforcement of Environmental legislation – Major issues related to this legislation.

Unit-V (Hours: 6)

ENERGY USE AND ENVIRONMENTAL IMPACTS

Energy used and environmental impacts – Global issues – Global climatic change – Greenhouse effect – Stratospheric ozone depletion – Biodiversity and habitat loss – Regional issues – Acid rain – Local issues – Urban pollution – Solid and hazardous waste.

Books for Study

1. Non – Conventional energy source – G.D. Rai, Khauna Publications, (2005).
2. Environmental & Science Engineering – A. Ravikrishnan- Sri Krishna publications, (2007).
3. Renewable energy – B.K. Bala, Agrotech Publisher, (2009).

Books for Reference

1. "Renewable energy sources and emerging Technologies" by D.P. Kothari, K.C. Singal and RakeshRanjan , Prentice Hall of India pvt. Ltd., New Delhi.
2. Solar energy - S.P. Sughatme, Tata McGraw Hill, (1998).
3. Fundamentals of energy renewable sources - D.Mukherjee and S. Chakrabarthi. New Age International Pvt. Ltd., (2007).

Web Resources

1. http://advanced.jhu.edu
2. http://www.thapar.edu

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Outline** the basic concepts of renewable and non-renewable energy sources	K_1
CO2	**Understand** the fundamental concepts of energy resources and its applications in everyday life.	K_2
CO3	**Apply** environmental legislation laws to prevent and control the pollution	K_3
CO4	**Analyze** the utilization of energy resources and its environmental impacts.	K_4
CO5	**Predict** various forms of the solar energy such as wind, biomass, hydro power, tidal energy etc.,	K_5

Programme Title : **B.Sc. Physics**
Course Title : **SPECTROSCOPY AND LASER PHYSICS**
Course Code : **22UPHC7** **Hours/Week : 3**
Semester : **IV** **Credits : 3**

Course Objective:

The aim of the course is to make the learners to understand the basics of spectroscopy and the phenomenon of laser action.

SYLLABUS

Unit-I (Hours: 9)

TYPES OF SPECTRA

Various spectral range of electromagnetic radiation- Types of spectra – emission and absorption spectra – Continuous, band and line spectra – Solar spectrum – Fraunhofer's lines – Ultraviolet spectra – Sources - Simple experimental set up – Characteristic features and applications – Infrared spectra – Sources – Simple experimental set up – Characteristic features and applications.

Unit-II (Hours: 9)

ROTATIONALSPECTRA

Molecular spectra-origin of molecular spectra, nature of molecular spectra –Different modes of molecular excitation Factors affecting line width, intensity of spectra. Classification of Molecules – Linear, Symmetric top, Asymmetric top and spherical top molecules – Theory of rotational spectra of diatomic molecules and its energy levels (rigid & non-rigid).

Unit-III (Hours: 9)

VIBRATIONAL SPECTRA

Theory of vibrational spectra of diatomic molecules and its energy levels(harmonic &anharmonic oscillator) –Theory of vibration rotational spectrum of a diatomic molecule-spectral range of IR radiation-types of vibration, Raman effect – Experimental set up – Characteristic features of Raman lines – Molecular structure.

Unit-IV (Hours: 9)

LASERS AND TYPES OF LASERS

Basic principles of laser – Einstein Coefficients – Condition for light amplification - Population inversion - Threshold condition – Optical resonators (Qualitative only) Types of Lasers – Construction and Working – Ruby Laser – He- Ne Laser , Nd YAG Laser.

Unit-V (Hours: 9)

APPLICATIONS OF LASER

Applications of Lasers in industry – Cutting – Welding – Drilling – Surface hardening – Medical applications – Laser as diagnostic and therapeutic tool – Holography – Theory of recording and reconstruction – Applications of holography – Holographic interferometry in nondestructive testing – Acoustic holography and– Laser Hazards.

Books for Study

1. Optics and Spectroscopy - R.Murugeshan, S.Chand (2005)
2. A Text book of Spectroscopy - M.S.Yadav, Anmol Publications, (2003)
3. A Text book of Optics N.Subrahmanyam, Brijlal, Avadhanulu M.N.S Chand (2013)
4. Modern Physics-R.Murugeshan (2018)
5. An Introduction to Laser and Spectroscopy David -L.Andrews & Andrey. A. Demidov

Books for Reference

1. An Introduction to Laser and Spectroscopy David -L.Andrews&Andrey. A. Demidov
2. Springer Publications, (2002)
3. Lasers and Non Linear optics - G.D.Baruah, PragathiPrakashan Publications, (2009)
4. 3.An introduction to Lasers, Theory and Applications - Avadhanulu M.N. -, S Chand & Co., New Delhi, (2001)
5. Physics for Engineering - P.K.Palanisamy, Scitech Publications private Ltd., (1999)
6. Optics - Gosakan, S.Chand& Co, (2001)

Web Resources

1. http//www.Spectroscopy links at Curlie
2. http//www."Laser Fundamentals" an online course by Prof. F. Balembois and Dr. S. Forget. Instrumentation for Optics.

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recognize** the fundamental properties of electromagnetic radiations and laser	K_1
CO2	Describe the basic concept of spectroscopy and Laser	K_2

CO3	**Apply** the principle of laser action to different types of lasers.	K_3
CO4	**Apply** the concept of quantum mechanics for determining the energy of the molecules	K_3
CO5	**Analyze** the analytical techniques in spectroscopy and lasers	K_4
CO6	**Perceive** the underlying principles of laser and spectroscopy in society related problems.	K_5

Mapping of COs with POs

CO	**PO**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	M	S	S	S	S
CO 3	S	S	S	S	M
CO 4	S	S	S	S	S
CO 5	S	S	S	S	M
CO6	S	S	S	S	M

Programme Title : B.Sc. Physics
Course Title : ELECTIVE – I : PHYSICS OF NANOMATERIALS
Course Code : 22UPHEC1 **Hours/Week : 3**
Semester : IV **Credits : 3**

Course Objective:

The aim of the course is to make the students to understand the basics of nanomaterials which have wide applications in various fields.

SYLLABUS

Unit-I (Hours: 9)

BASIC AND SCALE OF NANOTECHNOLOGY

Introduction-Nano Materials-Importance of nanotechnology-Nanostructures: 1D, 2D and 3D nanostructers (nanodots, thin films, nanowires, nanorods)-Dimensionality and size dependent phenomena-Particle size determination.

Unit-II (Hours: 9)

SYNTHESIS OF NANOSTRUCTURE AND MATERIALS

Top down and Bottom-up approach-Photolithography- Particle confinement - Chemical vapor deposition (CVD)- Classification based on dimensionality-Quantum dots-wells& wires.

Unit-III (Hours: 9)

CHARACTERIZATION

X-Ray Diffraction - Optical Microscopy-Scanning Electron Microscopy- Transmission Electron Microscopy.

Unit-IV (Hours: 9)

PROPERTIES OF NANOMATERIALS

Structural- Optical -Vibrational -Electrical- Mechanical Properties (Basic ideas only).

Unit-V (Hours: 9)

APPLICATIONS OF NANOMATERIALS

Nanomaterials in medicine – energy sector – Computer Technology – Communication – Industry.

Books for Study

1. C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
2. M.A. Shah Tokeer Ahmad, Principles of Nanoscience and Nanotechnology, Narosa Pub (2013)

Books for Reference

1. S.K. Kulkarni, Nanotechnology: Principles & Particles (Captial Publishing Comapny).
2. K.K. Chattopadhyay and A.N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited).
3. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

Web Resources

1. www.ucd.ie/nanobio/physics_nanomaterials.html

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Remember** the basic structure of the atoms and molecules.	K_1
CO2	**Explain** the basic physics behind size and shape of nanomaterials	K_2
CO3	**Apply** the concepts of Nanoscience to identify the optical, vibrational, electrical and mechanical properties of nanomaterials.	K_3
CO4	**Synthesize** nanomaterials using physical and chemical methods.	K_6
CO5	**Analyse** the application of Nanomaterials in various fields	K_4

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO 4	S	S	S	S	S
CO 5	S	S	S	S	S

Programme Title : **B.Sc. Physics**
Course Title : **ELECTIVE – I : GEO PHYSICS**
Course Code : **22UPHSEC1** **Hours/Week : 3**
Semester : **IV** **Credits : 3**

Course Objective:

The aim of the course is to enable the students to acquire the basic and fundamental knowledge in Earth Science in accordance with the Geo physical prospecting.

SYLLABUS

Unit-I (Hours: 9)

GRAVITY METHOD

Introduction - Gravitational field of the Earth - 'G 'and 'g' - gravity formula - Gravitational Field of the Earth – Densities of Rocks and Minerals – Instruments – The gravimeters and its Classification – Applications.

Unit-II (Hours: 9)

MAGNETIC METHODS

Introduction – Earth magnetism - Magnetic Susceptibilities of some Minerals -Magnetic Susceptibility values of some Indian Rocks – instruments – Magnetometers and its classification - Densities of some Minerals - Densities of some Rock formations of India. – Applications.

Unit-III (Hours: 9)

ELECTRICAL METHODS, EARTH RESISTIVITY METHOD AND SELF POTENTIAL

Electrical methods - Introduction – Self-potential (S.P.) method – Resistivity methods and principles – Potential drop ratio method - Electromagnetic (E.M.) Methods - Principles – Instruments Resistivity of Rocks and Minerals - Electrical conductivities of ores - methods of measurement-Self Potential - Definition – groundwater exploration (Qualitative study).

Unit-IV (Hours: 9)

SEISMIC METHODS

Seismic methods - General Principles – Elastic Properties of Rocks – Refraction and Reflection of Seismic Waves – General Scheme of Seismic Operations – Refraction methods - General Principles – Instruments and Equipment - Application – Reflection methods (Qualitative study). - General Principles – Instruments and Equipment – Application.

Unit-V (Hours: 9)

WELL LOGGING METHODS

Introduction - Electrical Logging methods – Resistivity Logging- Induction logging – Radioactivity logging method – Sonic logging – Miscellaneous Logging – Logging data interpretation - Applications of well logging method in Oil fields.

Books for Study

1. Fundamentals of Geophysics – William Lowrie –Cambridge University Press 2nd Edition (1997).
2. Outlines of Geophysical Prospecting – A manual for Geologists, M.B. Ramachandra Rao – EBD Educational Pvt., Ltd. (1975).

Books for Reference

1. Prasnis, Applied Geophysics – Chaparang Hall (1972).
2. Stanislane, M., Introduction to Applied Geophysics, Reidel Publishers (1984).

Web Resources

1. *https://pangea.stanford.edu/geophysics*
2. *https://en.wikipedia.org/wiki/Geophysics*

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Explain** basic concepts in earth science with respect to Geo Physical prospecting.	K_1
CO2	**Apply** Gravity magnetic electrical seismic and well logging methods to find the properties of Rock, Minerals, earth surface and Ground water	K_2
CO3	**Analyze** varies methods for geo physical properties of Rock mineral earth surface & ground water	K_3
CO4	**Evaluate** Physical Measurements may be taken on the mineral's boreholes and seismic waves.	K_4

Programme Title : B.Sc. Physics
Course Title : SKILL BASED – IV: RENEWABLE ENERGY RESOURCES
Course Code : 22UPHSC4 **Hours/Week : 2**
Semester : IV **Credits : 2**

Course Objective:

To understand the various forms of conventional energy resources. To know about the present day energy scenario and the need for energy conservation. To explain the concept of various forms of renewable energy and analyse the environmental aspects of renewable energy resource

SYLLABUS

Unit-I (Hours: 6)

SOURCES OF ENERGY

Energy definition-Renewable energy sources –Solar Energy-Wind energy-Ocean Energy-Tidal energy –Thermal energy- Geothermal energy –Biomass energy (Introduction only). Non-Renewable energy resources-Coal-Petroleum-LPG-Nuclear Energy-Uses of alternate energy source - Comparison between coal power and nuclear power.

Unit-II (Hours: 6)

SOLAR ENERGY AND ITS APPLICATIONS

Introduction of Solar energy- -Storage of solar energy (flow chart only) –solar pond-non convective solar pond-applications of solar pond-solar water heater –solar crop drying –solar distillation- -solar cooker-Photovoltaic systems –solar cell.

Unit-III (Hours: 6)

WIND ENERGY AND GEOTHERMAL ENERGY

Wind energy –Introduction –Fundamentals Principles –Power coefficient (definition and basic idea only) Basic component of wind energy conversion. Classification of Wind energy conversion –advantages and disadvantages.

Geothermal energy-Introduction-Nature of geothermal fields-Geothermal sources –hydrothermal convective resource- advantages and disadvantages.

Unit-IV (Hours: 6)

BIOMASS ENERGY AND OCEAN THERMAL ENERGY

Introduction- Biomass–Biomass conversion technologies –thermal chemical conversion– Fermentation-Wet process- Dry Process-Photosynthesis-Photosynthetic efficiency

Introduction-methods of ocean thermal electrical power generation-open cycle OTEC system-close OTEC system –advantages and disadvantages of tidal power generation.

Unit-V (Hours: 6)

ENERGY USE AND ENVIRONMENTAL IMPACTS

Energy used and environmental impacts –global issues –Global climate change –Greenhouse effect-stratospheric ozone depletion biodiversity and habit loss regional issues –Acid rain –Local issues –Urban pollution-Solid and hazardous waste.

Tutorial

1. Demonstration of solar energy utilization
2. Demonstration of Bio-mass energy utilization

Books for Study

1. Environmental science and engineering –A.Ravikrishnan-Sri Krishna Hi tech Publishing Company.
2. Nonconventional energy sources G.D Rai, KhannaPublishers, New Delhi.
3. Solar energy Fundamentals design Modelling and applications-G.N.Tiwari Naraosa Publishing House.
4. 4. Solar Energy Principles of thermal collection and storage S.P.Sukhatme & J.K Nayank Third Edition McGraw Hill and companies.
5. Renewable energy - B.K. Bala, Agrotech Publisher, (2009).
6. Solar energy fundamentals and its applications. Brajesh Priyadarshi. Ishwarbooks (Delhi).

Books for Reference

1. Solar Cell-Charles Cohen Argotech Press New Delhi.

Web Resources

1. NPTEL Course in Non-Conventional energy resources

Course Outcomes: On completion of the course, students should be able to

CO number	CO statement	Knowledge Level
CO1	**Recognize** the basic concepts of Renewable energy and	K_1

	Non-Renewable energy resources	
CO2	**Explain** the fundamental principles in solar, wind, geothermal, ocean and biomass energy	K_2
CO3	**Apply** the theories of Solar energy in device fabrication	K_3
CO4	**Analyse** the use of various forms of energy and its environmental impacts	K_4
CO5	**Suggest** solutions to energy crisis	K_5

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**S**
CO2	**S**	**S**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

Programme Title : B.Sc. Physics
Course Title : NME –II: ASTROPHYSICS
Course Code : 22UPHNEC2 **Hours/Week : 2**
Semester : IV **Credits : 2**

Course Objective:

The aim of the course is to enhance the student's ability to identify and understand the outer space.

SYLLABUS

Unit-I (Hours: 6)

EARTH, MOON, SUN AND SATELLITES

Earth in space- Days and years- Calendars - Tracking the cycle of the year – Phases and Eclipses – Motions of the moon – Phases of the moon – Solar eclipses –Total solar eclipses and Partial solar eclipses - Lunar eclipses - Total lunar eclipses and Partial lunar eclipses – Rockets and Satellites – Working of rockets – Multi stage rockets – Artificial satellites.

Unit-II (Hours: 6)

THE SOLAR SYSTEM

Observing the solar system – Earth at the centre – Sun at the centre – Inertia and gravity – The sun – The Sun's interior – The Sun's atmosphere - Photosphere, Chromosphere and Corona - Features on the sun – Sunspots – Prominences – Solar Flares.

Unit-III (Hours: 6)

PLANETS, COMETS ASTEROIDS AND METEORS

The Inner planets – Earth – Mercury – Venus – Mars – The outer planets – Jupiter – Saturn – Uranus – Neptune –Comets, Asteroids and Meteors.

Unit-IV (Hours: 6)

STARS AND TOOLS OF MODERN ASTRONOMY

Characteristics of stars – Classification, Size, Colour, Temperature and Brightness of stars – Lives, Lifetimes and Deaths of stars – Black holes - Tools of modern astronomy – Electromagnetic radiation – Telescopes – Reflective, Refractive and Radio telescopes – Spectrographs.

Unit-V (Hours: 6)

GALAXIES AND THE UNIVERSE

Galaxies – Milky Way Galaxy, Spiral, Elliptical, Irregular and Moving Galaxies – The Big Bang Theory, Pulsating theory and Steady State Theory– The future of the universe-Dark Matter and Energy.

Books for Study

1. Explorer – P.Michale J. Padilla, Prentice Hall (2002).

Books for Reference

1. Astrophysics for Physicists- Arnab Raj Choudhuri, Cambridge University, (1998).
2. In Quest of the Universe – Karl F. Kuhn, Jones & Bartlett (1994).
3. Physics of the University - A. Hewish., CSIR Publication, New Delhi (1995).
4. Asteroseismology -ConnyAerts, Springer (2007).
5. An introduction to modern astrophysics - Bradley W. Carroll, Addison Wesley (1995).

Web Resources

1. http://research.lib.buffalo.edu>astronomy
2. https://www.loc.gov.scitech>astronmy

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recognize** the features of earth, sun and moon	K_1
CO2	**Summarize** the fundamental concepts in astrophysics	K_2
CO3	**Describe** the features of planets, comets and asteroids	K_2
CO4	**Analyze** the characteristics of stars and tools of modern astronomy	K_2
CO5	**Categorize** the theories of galaxies	K_4

Programme Title : B.Sc. Physics
Course Title : ELECTRICITY AND MAGNETISM
Course Code : 22UPHC8 **Hours/Week : 6**
Semester : V **Credits : 5**

Course Objective:

To make the students to understand the basics of electricity and magnetism which have wide application in various field. To identify, formulate and solve real world problems related to Electricity and Magnetism.

SYLLABUS

Unit-I (Hours: 18)

CHARGES, FIELDS & CAPACITORS

Coulomb's law – Superposition principle – Electric field –Electric field due to point charge -Flux of electric field –Gauss's law –Differential form of Gauss law- Application of Gauss law–An insulated conductor– Electric field due to a uniformly charged sphere – Isolated uniformly charged conducting sphere (i.e) charged spherical shell – Field due to infinite plane sheet of charge – Coulomb's theorem -– Deduction ofCoulomb's inverse square law from Gauss law.

Potential difference – Electric potential – Electric potential as line integral of electric field – Potential at a point due to a point charge – Relation between potential and intensity $E=-\Delta V$–Potential at a point due to a uniformly charged non-conducting solid sphere– Potential and Field due to an electric dipole. Capacitance – Principle of capacitance–spherical capacitance in outer sphere earthed-spherical capacitance in inner sphere earthed.

Unit-II (Hours: 18)

ELECTRICITY

Carey Foster's bridge – Determination of temperature co- efficientofresistance–Potentiometer-calibration of ammeter– High and low range voltmeter - Measurement of thermo emf - Laws of thermo

emf – Seebeck, Peltier and Thomson effects- Thermo dynamics ofthermocouple–Thermoelectric diagrams-uses of thermoelectric diagrams–Gibb's Helmholtz equation–calculation of emf of a Daniel cell.

Unit-III (Hours: 18)

MAGNETIC EFFECT OF ELECTRIC CURRENT

Ampere's swimming rule – Maxwell's Cork Screw rule – Right hand clasp rule – Magnetic field – Magnetic inductions – Fleming's left hand rule – Biot – Savart rule (only definitions) – Magnetic Induction in a straight conductor - Magnetic induction at a point on the axis of a circular coil carrying current at any point on the axis of a solenoid carrying current– Effect of iron core in a solenoid – Torque on a current loop in a uniform magnetic field – Moving coil ballistic galvanometer – theory – Damping correction–uses of B.G.–measurement of charge sensitiveness- Absolute capacitance of a capacitor– Mutual inductance.

Unit-IV (Hours: 18)

TRANSIENT CURRENT

Growth and Decay of current in a circuit containing inductance Land resistance R with steady emf - Growth and decay of charge in a CR circuit – Determination of high resistance by leakage - Growth and decay of charge in a LCR Circuit– Condition for the discharge to be oscillatory– Frequency of oscillation.

ALTERNATING CURRENT

Emf induced in a coil rotating in a magnetic field average and rms values of A.C. voltage and current–AC circuit containing resistance, inductance and capacitance in series and parallel resonant circuit – Power in an ac circuit containing L, C and R– Wattless current.

Unit-V (Hours: 18)

MAGNETISM

Magnetic induction – Magnetization – Susceptibility-permeability and relation between them ($B=\mu_0(M+H)$)–IH and BH loops-Magneto meter method of drawing I-H curve–energy loss due to hysteresis –uses of hysteresis curves–magnetic alloys–magnetic circuits–determination of susceptibility– Curie Balance method–Guoy's method.

Derivation of Maxwell's electromagnetic equation – Displacement current and its magnitude– Electromagnetic waves in free space– Velocity of light – Transverse nature of electromagnetic waves.

Books for Study

1. Electricity and Magnetism -K.K.Tiwari – (2017)
2. Fundamentals of Electricity and Magnetism –D.N.Vasudeva
3. Electricity and Magnetism – Debasish Chattopadhyay & Phatik Chandra Rakshit(2011)
4. Electricity and Magnetism- R.Murugeshan, S.Chand & Co, NewDelhi (2008)

Books for Reference

1. Electricity and Magnetism-Brijlal and Subramaniam, Prem Chand Jain,(1984)
2. Electricity and Magnetism - Narayanamurthi and Nagarathinam, National Publishing & Co,(1994)
3. Electricity and magnetism-Seghal, Chopra, Sultan Chand & Co,(2005)

Web Resources

1. https://youtu.be/QQZ6EGf0Ju8 -Unit V
2. www. Electricity and magnetism- Hyper Physics. Georgia State University.http://faculty.wcas.northwestern.edu/~infocom/Ideas/electric.html

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic rules in electricity and magnetism	K_1
CO2	**Discuss** the concepts of electrostatics, electricity and magnetism	K_2
CO3	**Apply** the knowledge of electricity and magnetism in solving problems	K_3
CO4	**Analyse** the working of electrical circuits and magnetic effects	K_4
CO5	**Predict** the behavior of thermoelectric, transient and alternating current	K_5

Mapping of COs with POs

CO	PO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	S	L	S	M
CO2	S	S	M	S	S
CO3	S	S	S	S	S
CO4	S	M	M	S	S
CO5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title : ANALOG ELECTRONICS
Course Code : 22UPHC9 **Hours/Week : 5**
Semester : V **Credits : 5**

Course Objective:

The aim of the course is to enable the students to acquire the basic and fundamentalknowledge on electronics theory and practical.

SYLLABUS

Unit-I (Hours: 15)

SEMICONDUCTOR DIODES

Introduction to semiconductors- p type-n type semiconductors-P- N Junction diode - Forward bias - Reverse bias- Zener diode - Characteristics - Zener breakdown voltage - Zener diode regulated power supply - Break down mechanisms of Semiconductor Diodes - Avalanche break down-Photo diode, Tunnel diode, Schottky, LED, PIN diode and Laser diode (Basic idea). Applications-Rectifiers –filters (qualitative study).

Unit-II (Hours: 15)

JUNCTION TRANSISTOR AND H - PARAMETERS

Junction transistor - PNP and NPN transistors - Mechanism of transistor action- A transistor amplifier-Current components in atransistor- CB, CE and CC configuration -Static characteristics of atransistor - relation between α and β - two port representations of a transistor - Determination of h-parameters- Conversion formula - Typical h-parameter values for a junction transistor - Analysis of a CE transistor amplifier using h-parameter - approximate expression for current gain , voltage gain , input impedance , output impedance, power gain in decibels - High frequency effects in a transistor (Qualitative study).

Unit-III (Hours: 15)

SEMICONDUCTOR DEVICES

Junction field effect transistor (JFET) - Static characteristics of a JFET Pinch-off voltage - characteristics - MOSFET - Enhancement and depletion MOSFET - Uni junction transistor (UJT) - construction and working - characteristics - UJT as relaxation oscillator - silicon controlled rectifier (SCR)- construction and working - equivalent circuit of SCR - characteristics - SCR as a switch and rectifier.

Unit-IV (Hours: 15)

AMPLIFIERS AND OSCILLATORS

Classification of amplifiers -Voltage amplifiers - RC coupled amplifier - Frequency response and

gain - Class B push pull amplifier and their efficiencies –Transfer gain of a feedback amplifiers– Feedback amplifier topologies.

Barkhausen criterion for oscillation - Hartley, Colpitt's, Phase shift and Wien bridge oscillator - determination of frequency and condition forstability - crystal oscillator (qualitative study).

Unit-V (Hours: 15)

OPERATIONAL AMPLIFIERS

Integrated circuits-Introduction to Operational amplifiers-virtual ground – Ideal OP-AMP and typical OP-AMP characteristics-concept offeedback- inverting and non-inverting amplifiers - current to voltage converter- unit gain amplifier- summing amplifier -Averager- difference amplifier- differentiator - integrator -Comparator-Applications- instrumentation amplifiers -current boosters(qualitative study)

Books for Study

1. Electronics Fundamental and applications - D.Chattopadhya, New Age International (P) Ltd, 5th Edition, 2007.
2. A Text book of Applied Electronics-R.S.Sedha Chand & Co. Ltd. New Delhi, Reprint2010
3. Basic Electronics Solid state-B.L. Theraja, Chand & Co. Ltd, New Delhi Edition 2017

Books for Reference

1. Principles of Electronics-V. K. Mehta, S.Chand& Co, 5th Edition, 1994.
2. Introduction to Integrated Electronics Digital & Analog V.Vijayendran S.Viswanathan(Printers and Publishers),PVT.,LTD. (2007)
3. Electronics Devices and Circuits - S.Salivahanan, N.Suresh Kumar, A.vallavaraj,Tata McGraw-Hill publishing company limited, 2004 2nd Edition

Web Resources

1. https://en.wikipedia.org/wiki/Semiconductor_device
2. https://en.wikipedia.org/wiki/Bipolar_junction_transistor
3. https://nptel.ac.in/courses/122/106/1221060253
4. NPTEL Video Contents

CO Number	CO Statement	Knowledge Level
CO1	**Remember** the properties and applications of semiconductor diodes and transistors.	K_1
CO2	**Demonstrate** the working principles of Semiconducting devices such as amplifiers and oscillators	K_2
CO3	**Apply** the principles of solid-state semiconductors to the study the electronic circuits	K_3
CO4	**Analyze** and design oscillators using BJTS, FETs and OPAMPs	K_4

Course Outcomes: On completion of the course, students should be able to

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	M	S
CO 2	S	M	M	S	M
CO 3	S	S	M	S	M
CO 4	S	M	S	M	S

Programme Title : B.Sc. Physics
Course Title : NUMERICAL METHODS
Course Code : 22UPHC10 **Hours/Week : 5**
Semester : V **Credits : 5**

Course Objective:

To solve mathematical problems arising in engineering and science that cannot be solved by exact methods.

SYLLABUS

Unit-I (Hours: 15)

CURVE FITTING

Principle of least squares - Fitting a straight line, parabola, exponential curve of the form $y = ax^b$ and $y = ab^x$.

ROOT OF EQUATIONS

Iteration method - Bisection method - Successive approximation-Regula Falsi method - Newton-Raphson method.

Unit-II (Hours: 15)

MATRIX AND LINEAR EQUATIONS

Introduction – Pivotal condensation method – System of linear equations - Gauss elimination method – Gauss - Seidal method –Gauss Jacobi method - Gauss Jordan elimination method - Iterative method - matrix inversion method.

Unit-III (Hours: 15)

INTERPOLATION

Linear interpolation –Quadratic interpolation - Lagrange's interpolation method – Richardson's extrapolation – Aitken's iterated interpolation.

DIFFERENTIAL EQUATIONS

Introduction - Euler's method (Adams Bashforth first order method)- backward - Euler method- Taylor's series method - Runge-Kutta method – IV order only- Predictor corrector method.

Unit-IV (Hours: 15)

NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical differentiation - approximation of derivatives using interpolation polynomials - Taylor series method.

Numerical Integration - trapezoidal rule-simpson's 1/3 and 3/8 rules – Weddle's rule.

Unit-V (Hours: 15)

COMPUTATIONAL ERROR

Error Analysis - Types of errors, Propagation of errors, Correct and Significant digits - Rounding off Rule - Important theorems on absolute error and relative error with proof - General expression for error.

EIGEN VALUES AND EIGEN VECTORS

Largest and Smallest eigen values and eigen vectors by power and inverse power method

Books for Study

1. Fortran 77 and Numerical Methods – C.Xavier, Wiley Eastern Ltd.,(1994).
2. Numerical methods – P.Kandasamy, K.Gunavathy, K.Thilagavathy S.Chand & Co., Second edition, (2003).

Books for Reference

1. Numerical methods in Science and Engineering – Venkatraman M.K., National Publishing Co., (2005).
2. Numerical methods - A.Singaravelu, Meenakshi Agency, Chennai,(2004).
3. Numerical methods in Engineering and Science -Grewal, B.S. et al., Khanna Publications, (2012).
4. Introductory methods of numerical analysis - S.S. Sastry, Prentice Hall of India, New Delhi.,(2006).
5. Numerical Methods for Scientists and Engineers – Sankara Rao K, 3rd edition, Prentice Hall of India Private Ltd, New Delhi, (2007).
6. Applied Numerical Analysis - Gerald, C. F. and Wheatley, P.O, 6th Edition, Pearson Education Asia, New Delhi,(2006).
7. Numerical Methods for Scientific and Engineering Computation Jain - M.K., Iyengar, S.R., and Jain, R.K, Wiley Eastern, (1992).

Web Resources

1. https://nptel.ac.in/courses/122/106/122106025
2. NPTEL Video Contents

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Discuss** the numerical methods to find approximate solution for various problems	K_2
CO2	**Apply** numerical techniques to solve linear and differential equations	K_3
CO3	**Distinguish** between numerical and analytical methods along with their errors	K_4
CO4	**Assess** the numerical techniques for problems in Physics	K_5

Mapping of COs with POs

CO	PO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	L	S	M	S
CO2	S	L	S	S	S
CO3	M	M	S	L	S
CO4	S	L	S	M	S

Programme Title	**: B.Sc. Physics**	
Course Title	**: ELECTIVE - II: RELATIVITY AND QUANTUM MECHANICS**	
Course Code	**: 22UPHEC2**	**Hours/Week : 5**
Semester	**: V**	**Credits : 5**

Course Objective:

To familiarize the formalism of Quantum Mechanics and relativity.

SYLLABUS

Unit-I (Hours: 15)

RELATIVITY

General theory of relativity-Frames of reference- inertial frames of reference- Galilean transformation equations- Michelson Morley experiment – explanation of negative result – postulates of special theory of relativity- Lorentz transformation equation – Length contraction and time dilation – addition of velocities – variation of mass with velocity – Einstein's mass energy equivalence- relativity of simultaneity- Minkowski's space time continuum.

Unit-II (Hours: 15)

WAVE PROPERTIES

Dual nature of matter – De Broglie's concept of matter waves- Expression for De-Broglie's wavelength – Wave pocket – Expression for phase velocity and group velocity and relation between them – G.P.Thomson experiment – Heisenberg's uncertainty principal- physical significance of uncertainty relation – Elementary proof of uncertainty principle - Gamma ray microscope.

Unit-III (Hours: 15)

WAVE EQUATION

Postulates of quantum mechanics Wave function for a free particle – Physical interpretation of wave function – derivation of one-dimensional time dependent and time independent Schrodinger's wave equation- Orthogonal and normalized wave functions – Eigen functions, Eigen value and Eigen value equation – Orthogonality of Eigen function – Expectation's value – probability current density.

Unit-IV (Hours: 15)

OPERATOR FORMALISM

Linear operator –commuting and non-commuting operators –operators for momentum, kinetic energy and total energy –Hamiltonian operator-commutation relation between position and momentum and between Hamiltonian and momentum – Hermitian operator and their properties- Angular momentum operator – commutation relation between Lx, Ly, Lz and L - Ladder operator L+ and L- - Commutation relation between L and position.

Unit-V (Hours: 15)

***S*OLUTIONS OF SCHRODINGER EQUATION**

Free states – free particle Free particle solution - rectangular potential barrier - reflection and transmission coefficients-– bound states – particle in an infinitely deep one- dimensional potential well Particle in a box - Potential well of finite depth)one dimension(- linear harmonic oscillator - rigid rotator.

Books for Study

1. Modern physics R.Murugeshan & Karthiga Sivaprasath, S.Chand & Company Ltd 18th edition 2016.

2. Quantum Mechanics by SatyaPrakash & Swati Saluja, Kedarnath Ramnath, Meerut (2019).

Books for Reference

1. Concepts of Modern Physics - Arthur Beiser, TMH, New Delhi (2015).

2. Modern Physics S.K. Gupta and B.S. Agrwal Kedar Nath Ram Nath 1st edition 2017.

Web Resources

1. https://houseofphy.blogspot.in/ Modern Physics Notes (HRK) By Muhammad Ali Malik
2. http://www.freebookcentre.net/Physics/Modern-Physics-Books.htmlnuclear Physics books
3. http://www.freebookcentre.net/Physics/Nuclear-Physics-Books.html

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Define** the basic concepts of relativity and wave mechanics	K_1
CO2	**Summarize** the concepts of relativity and quantum mechanics	K_2
CO3	**Apply** quantum mechanical operators to solve the problems	K_3
CO4	**Analyze** suitable approximation methods	K_4
CO5	**Interpret** the principles of quantum mechanics	K_5
CO6	**Solve** Schrodinger equations using approximation methods	K_6

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	**S**	**S**	S	S	M
CO 2	S	S	S	S	S
CO 3	S	S	S	M	S
CO 4	S	S	S	M	M
CO 5	S	S	S	M	S
CO 6	S	S	S	S	M

Programme Title : **B.Sc. Physics**
Course Title : **ELECTIVE - II : FUNDAMENTALS OF MICROPROCESSOR**
Course Code : **22UPHSEC2** **Hours/Week : 5**
Semester : **V** **Credits : 5**

Course Objective:

The aim of the course is to enable the students to acquire the basic knowledge about microprocessor.

SYLLABUS

Unit-I (Hours: 15)

Architecture of 8085 microprocessor, registers, flags, ALU – Address bus and data bus – Demultiplexing address/data bus – control and status signals – control bus – Programmer's model of 8085 – Pin-out signal function diagram – Functions of different pins.

Unit-II (Hours: 15)

Instruction set of 8085 – Data transfer, arithmetic, logic, branching and machine control group of instruction – Addressing modes –Register, register indirect, direct, immediate and implied addressing modes.

Assembly language and machine language – Programming exercises – addition, subtraction, multiplication and division (all 8-bit binary), ascending order/ descending order.

Unit-III (Hours: 15)

Memory interface – Interfacing 2Kx8 ROM and RAM interface –Timing diagram of 8085 instructions (MOV Rd, Rs –MVI data 8)

Unit-IV (Hours: 15)

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – Flashing LEDs.

Unit-V (Hours: 15)

Interrupts in 8085 – Hardware and software interrupts –RIM, SIM instructions – Priorities Simple – Polled and interrupt-controlled data transfer.

Books for Study

1. Microprocessor Architecture Programming and Application with 8085/8080 by Ramesh Gaonkar, Willey Eastern.
2. Fundamentals of Microprocessor 8085 by – V. Vijayendran, S.Viswanathan Publishers, Chennai.

Books for Reference

1. Introduction to Microprocessor by Aditya Mathur.
2. Introduction to microprocessor by Lance A. Leventhal.

Web Resources

1. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.htm

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the instruction set of 8085 Microprocessor	K_1
CO2	**Describe** the architectureand different modes of operations of a Microprocessor	K_2
CO3	**Apply** the knowledge in the field of interfacing input and output port to 8085 Microprocessor	K_3
CO4	**Analyze** the interrupts in 8085 Microprocessor	K_4
CO5	**Develop** assembly language programmes using various programming tools	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	**S**	**S**	S	S	M
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO 4	S	S	S	M	S
CO 5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title : CORE PRACTICAL - III
Course Code : 22UPHQC3 **Hours/Week : 3**
Semester : V &VI **Credits : 3**

Course Objective:

The course aims to develop the skill to gain knowledge in Physics Lab

SYLLABUS **Total hours :90**

Any Fifteen Experiments

1. Young's Modulus- Uniform bending-Koenig's method.
2. Young's Modulus- Cantilever – Pin and Microscope.
3. Surface Tension– Capillary Rise Method.
4. Potentiometer-Emf of a thermocouple- First method.
5. B.G-Determination of absolute capacity of a condenser.
6. BG- Emf of a thermocouple- Direct deflection method.
7. Spectrometer-Grating-Normal incidence–Dispersive power.
8. Spectrometer-Narrow Angled Prism.
9. Newton's ring-Refractive index of convex lens.
10. Specific heat capacity of a liquid and emissivity of surface by Newton'slaw of cooling.
11. NAND and NOR gates as universal building blocks
12. Characteristics of FET
13. IC Regulated Dual power supply (12V-0-12V)
14. Verification of DeMorgan's law using IC's
15. Half adder and Full adder using NAND Gates
16. RC Coupled Amplifier- Single Stage
17. SCR-Characteristics.
18. Measurements of voltage, current and resistance using multi-meter.
19. Addition and Subtraction of two 8-bit numbers using 8085 microprocessors.
20. Specific rotatory power of sugar solution by polarimeter.
21. Astable multivibrators using transistors.
22. To observe different voltage waveforms by Clipping and clamping of circuitswith suitable diodes.

Books for Study

1. Practical Physics and Electronics - C.C.Ouseph, U.J.Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., (2007).
2. A text book of Practical Physics-M. N.Srinivasan and others, Sultan Chand and Sons (2014).

Books for Reference

1. B.Sc Practical Physics -C.L. Arora, S.Chand (1995).

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Know ledge Level
CO1	**Infer** the electrical, optical, thermal properties of Materials	K_2
CO2	**Apply** the theoretical knowledge to carry out the experiments	K_3
CO3	**Examine** the working principles behind spectrotometer, ballistic galvanometer and potentiometer	K_4
CO4	**Construct** basic digital circuits using ICS	K_6
CO5	**Determine** various physics quantities by applying the principles of physics	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	S
CO 3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	M	S

Programme Title : B.Sc. Physics
Course Title : CORE PRACTICAL - IV
Course Code : 22UPHQC4 **Hours/Week : 3**
Semester : V & VI **Credits : 3**

Course Objective:

The aim of the course is to develop practical skills in mechanical, electrical, heat and optics experiments

SYLLABUS **Total hours: 90**

Any Fourteen Experiments

1. Young's Modulus–Non-uniform bending-Koenig's method.
2. Young's Modulus–Cantilever–Mirror and Telescope.
3. Carey Foster's Bridge –Temperature co-efficient.
4. B.G.–Comparison of Mutual Inductance.
5. B.G. – Absolute determination of Mutual Inductance of a pair ofcoils.
6. Potentiometer–Calibration of High Range Voltmeter.
7. Field along the axis of the coil-B$_H$ determination.
8. Melde's string–Transverse mode and longitudinal mode.
9. Spectrometer –(i-i') curve and refractive index of the prism
10. Determination of Cauchy's constant using spectrometer.
11. OP-Amp–Summing and Difference Amplifiers.
12. Integrator and Differentiator using Op–Amp.
13. UJT Characteristics.
14. Half Subtractor and Full Subtractor using NAND gates.
15. Determination of frequencies by Hartley oscillator using Transistors.
16. Determination of frequencies by Colpitt's oscillator using Transistors.
17. Measurement of displacement using LVDT.
18. Multiplication and Division of two 8-bit number using 8085microprocessors.
19. V-I characteristics of solar panel
20. Study of series resonances circuit.
21. Study of parallel resonances circuit.
22. Determination of compressibility of liquids-acousto optic effect.

Books for Study

1. Practical Physics and Electronics - C.C.Ouseph, U.J.Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., (2007).
2. A text book of Practical Physics-M.N.Srinivasan and others, Sultan Chand and Sons (2014).

Books for Reference

1. B.Sc Practical Physics-C.L.Arora, S.Chand (1995).

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Know** the working principles of various instruments	K_1
CO2	**Explain** the theory behind the experiments	K_2
CO3	**Apply** the theory of elasticity, heat, light, electricity and sound to laboratory experiments	K3
CO4	**Analyse** the electronics experiments.	K_4
CO5	**Construct** electronic circuits based on theoretical knowledge	K6

Mapping of COs with POs

CO	PO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	M	M	M	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S

Programme Title : **B.Sc. Physics**
Course Title : **NMSB – I INTRODUCTORY BIO PHYSICS**
Course Code : **22UPHNSC1** **Hours/Week : 2**
Semester : **V** **Credits : 2**

Course Objective:

To introduce the basic idea and the principles of bio physics.

SYLLABUS

Unit-I (Hours: 6)

PHYSICO - CHEMICAL TECHNIQUES

Atoms-Hydrogen, Helium, Carbon, Nitrogen, Oxygen and Chlorine atoms- stable atoms-chemical bonds-ionic bonds- covalent bonds – Hydrogen Bonds- Hydrophobic Interactions-Colloidal interactions - Hydration of macromolecules- Diffusion and osmosis - Understanding friction (qualitative study).

Unit-II (Hours: 6)

BIOENERGETICS AND BIOMOLECULES

First and Second Laws of thermodynamics- concept of free energy-Living systems and equilibrium state- Chloroplast Bioenergetics

Amino acids - Primary structures of protein- the peptides and Secondary structures of protein, Tertiary structures-super secondary and domain structure.

Unit-III (Hours: 6)

NEURO BIOPHYSICS

The nervous system - Physics of membrane potentials - Physical aspects of hearing - Signal transduction (qualitative study).

Membrane potential due to diffusion – The Physiology of sight - Electrical activity and visual generator potentials –optical defects of eye- Physical aspect of hearing – the ear.

Unit-IV (Hours: 6)

MECHANICS OF TISSUE, BONES AND MUSCLES

Starling pressure and edema prevention–Interstitial Fluid transport- Lymphatic morphology-mechanics of Lymphatic valve - The surface of the bone – Bone fracture –Joint stability and mobility-Body muscles-Physiological approach- categories of muscle contraction –Group action of muscle- The muscle twitch (Qualitative study) -Blood pressure – Electrical activity during the heart beat through EGC (Basic idea).

Unit-V (Hours: 6)

FLUORESCENCE, PHOSPHORESCENCE AND BIOLUMINESCENCE

Fluorescence and its use- Phosphorescence and its characteristics - Types of Bioluminescence - Mechanism of Bioluminescence - Bioenergetics of Bioluminescence - Bioluminescence in fire fly - physical characteristics of Bioluminescence (Basic idea).

Books for Study

1. Biophysics – Vasantha Pattabi and N.GauthamNarosa , Springer, 1stedu (2007)
2. Molecular and cellular Biophysics by Yougesh Kumar and Rajeev Tyagi Mangalam Publishers and Distributers, Delhi, (2013).
3. Bio Physics – Dr. S. Thiravia Raj, Saras Publication, (1993).
4. Bio Physics and Bio Instrumentation – Dr. N. Arumugam, Prof. V. Saras Pub,(2012).

Books for Reference

1. Principles of Bio Physics – Dr. S. Palanychamy, Dr. M. Shunmugavelu, Palani Paramount Publications, first edition 1992, second revised enlarged edition (1996) Reprint (2002).
2. Elementary Bio Physics – P.K. Srivastava, Narosa Publishing House, second edition.
3. Bio Physics – Mohan P. Arora, Himalaya Publishing house, First Edition (2004).
4. Biophysics: Principles and Technique - M .A. Subramanian, MJP Publishers,
5. Essentials of Biophysics - P. Narayanan, AnshanLtd., 2nd Revised Edition.
6. Introduction to Bio Physics - Pranab Kumar Banerjee , S Chand , (2010).
7. Essentials of Biophysics - P.Narayanan, New Age International Publishers, (2000).

Course Outcomes: On completion of the course, students should be able to

Course Outcomes: At the end of the course the student should be able to:		
CO Number	**CO Statement**	**Knowledge Level**
CO1	**Recall** the knowledge of atoms of living system.	K_1
CO2	**Relate** the concepts of atoms, molecules and the laws of thermodynamics**.**	K_2
CO3	**Compare** and contrast the knowledge of Physics of membrane for hearing and Signal transduction and Identify the various biological applications.	K_3

Programme Title : B.Sc. Physics
Course Title : SOLID STATE PHYSICS **Hours/Week : 6**
Course Code : 22UPHC11 **Credits : 5**
Semester : VI

SYLLABUS

Course Objective:

The course aims to study the basic idea of crystal structure, atomic bonding and Imperfections and also to make the students aware of the fact that the new materials are rapidly being developed and it is possibleto change the properties of materials.

UNIT – I(Hours: 18)

CRYSTAL STRUCTURE

Crystallography: Crystalline and Amorphous Solids- Crystal Lattice- Basis-Primitive and Unit Cell- Lattice Parameters of Unit Cell - Bravais Lattice-Nomenclature of Crystal Directions-Nomenclature of Crystal Planes: Miller Indices- Procedure for finding Miller Indices - Perpendicular distance between two parallel planes in a Cubic Crystal Lattice-Important Features of Miller Indices– Crystal Structures of Important Engineering Materials: Atomic Radius-Coordination Number - Density of Packing—Structure of Crystals-Simple Cubic, Body Centered Cubic Structure, Face Centered Cubic Structure, Hexagonal Close Packed Structure, Diamond Structure, Zinc Blende Structure, Sodium Chloride Structure, Caesium Chloride.

UNIT – II(Hours: 18)

CHEMICAL BONDING, DIFFRACTION OF X-RAYS ANDCRYSTAL IMPERFECTIONS

Review of atomic structure – Primary Bonds: ionic, valence and metallic – Secondary bonds: Vanderwaals's and hydrogen bonding –Diffraction of X-rays by crystals: Bragg's law in one dimension – Experimental method to determine the crystal structure: Rotating crystal method and powder photograph method – Crystal imperfections: Point defects – Frenkel and Schottky defects – equilibrium concentrations –Line defects–Edge dislocation and Screw dislocation–Surface defects– Grain boundary–Effects of crystal imperfection.

UNIT – III(Hours: 18)

ELECTRON THEORY OF SOLIDS

Introduction- the classical free electron theory and the quantum free electron theory-Electron energies in metals and fermi energy- density of states- antisymmetric nature of the wave functions of the Fermi system-electron in a periodic potential- energy bands in solids- brillouin zones-distinction between metals, insulators and semiconductors-effective mass of electron and concept of holes- Hall effect: Hall voltage and Hall coefficient, experimental determination of Hall co-efficient.

UNIT – IV (Hours: 18)

MAGNETIC AND DIELECTRIC PROPERTIES

Magnetic Properties

Introduction–Different types of magnetic materials–classical theory of diamagnetism (Langevin theory)-Langevin theory of paramagnetism-Weiss theory of paramagnetism–Weiss theory of ferromagnetism (molecular field theory on ferromagnetism).

Dielectric Properties

Fundamental definitions–Different types of electric polarization–Electronic Polarisation–Calculation of Electronic Polarisability–Frequency and temperature effects on Polarisation –Dielectric loss –Local field for a cubic structure– Clausius– Mosotti relation.

UNIT – V (Hours: 18)

SEMICONDUCTING MATERIALS AND SUPER CONDUCTING MATERIALS

Semiconducting Materials

Introduction-Characteristic Properties of Semiconductors-Intrinsic Semiconductors-Carrier Concentration in Intrinsic Semiconductors - Extrinsic Semiconductors- N-Type Semiconductors-Carrier Concentration N-Type Semiconductors–P-Type Semiconductors-Carrier Concentration P-Type Semiconductors-Variation of Carrier Concentration with Temperature.

Superconducting Materials

Introduction–Meissner Effect–General properties of superconductors-Type I and Type II Superconductors.

Book for Study:

1. Material Science-M.Arumugam, Anuradha Publications Chennai.(2016).
2. Solid State Physics –S.O.Pillai-New Age International Publications(2018).
3. Solid State Physics–Dr.K. Ilangovan, S.Viswanathan (printers and publishers) (2007).

Books for Reference:

1. Solid State Physics - Dr.S.L. Gupta & V. Kumar, Kedarnath & Co Educational Publishers, Meerut(2009).
2. Statistical & Solid State Physics - B.Basavaraj, P.Sadashiva & S.Siddappa, Omkar Publications, Bangalore.

Web Resources:

1.https://nptel.ac.in/courses/115/105/115105099/

2.https://nptel.ac.in/courses/115/103/115103108/

3.https://nptel.ac.in/courses/115/104/115104109/

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic concepts of solid state physics	K_1
CO2	**Describe** the magnetic, dielectric, superconducting behavior of solids.	K_2
CO3	**Apply** the concepts of solids state physics to solve problems	K_3
CO4	**Distinguish** between the different types of materials	K_4
CO5	**Determine** various parameters in solid state physics	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	S
CO 3	S	S	S	S	M
CO 4	S	S	S	S	S
CO 5	S	S	S	S	M

Programme Title : B.Sc. Physics
Course Title : NUCLEAR PHYSICS **Hours/Week : 5**
Course Code : 22UPHC12 **Credits : 5**
Semester : VI

Course Objective:

The aim of the course is to impart basic concepts of nucleus properties of nuclear particles, mechanism of natural radioactivity, particle accelerators, nuclear models, fission and fusion process, matter and antimatter and origin of cosmic rays.

SYLLABUS

UNIT – I (Hours: 15)

PROPERTIES AND STRUCTURE OF NUCLEI

Classification of nuclei-General properties of nucleus- binding energy –BE/A curve-nuclear stability- significance-proton electron theory- proton neutron theory -nuclear forces –characteristics – Meson theory of nuclear forces – Yukawa Potential- Nuclear models-liquid drop model, shell model.

UNIT – II (Hours: 15)

RADIOACTIVITY

Fundamental laws of radioactivity–derivation for half- life, mean life, decay constant - Law of successive disintegration-secular and transient equilibrium - Theory of α, β and γ decay- properties of alpha, beta and gamma rays– range of alpha particles–Geiger Nuttal law- alpha spectra, Beta ray spectrum- neutrino and its properties – electron capture. Gamma ray spectra - - nuclear isomers-Mossabauer effect –applications-Radio carbon Dating-Biological effects of Nuclear Radiations.

UNIT – III (Hours: 15)

NUCLEAR DETECTORS AND PARTICLE ACCELERATORS

Detectors- Ionization chamber, G.M. Counter-scintillation counter-Bubble chamber-Wilson cloud chamber-Semiconductor Junction Detector. Accelerators-synchrocyclotron – Betatron- Synchrotrons-Electron and Proton Synchrotrons.

UNIT –IV (Hours: 15)

NUCLEAR REACTIONS AND RADIATION HAZARDS

Artificial transmutation-Bohr's theory of nuclear disintegration-Q value of nuclear reaction-types of nuclear reactions - Kinematics of nuclear reaction-nuclear fission–Nuclear fusion–Nuclear reactor-uses - atom bomb -hydrogen bomb-fusion reactor –plasma confinement –Trans uranic elements. Application of radioactive isotopes Radiation Hazards-Radiation levels for safety-Radiation Protection methods-Nuclear Disasters-Nuclear Waste disposal.

UNIT – V (Hours: 15)

COSMIC RAYS AND ELEMENTARY PARTICLES

Cosmic rays-introduction-discovery-latitude, altitude and azimuth effects-longitudinal effect-north–south effect-seasonal and diurnal changes-primary and secondary cosmic rays-nature of cosmic rays-cosmic ray showers-Van Allenbelt-origin of cosmic radiation.

Elementary particles-introduction-Classification - particles and antiparticles- matter and antimatter-the fundamental interactions-elementary particle quantum numbers-conservation laws and symmetry.

Book for Study:

1. Modern Physics-R..Murugesan, S.Chand & Co, NewDelhi (2018).

Books for Reference:

1. Concepts of Modern Physics-Arthur Beiser, TMH, NewDelhi (2015).
2. Elements of Nuclear Physics-M.L.Pandya and R.P.S.Yadav, Kedarnath Ramnath Publishing(2009).
3. Nuclear physics-D.C.Tayal, Himalaya Publishing House(2009)
4. Atomic and Nuclear Physics by Shatendra Sharma–Dorling Kindersley India(2005)
5. Nuclear Physics–An introduction by S.B.Patel– NewAge international (P) Ltd (reprint2003)
6. Nuclear physics and particle physics by SATHYA PRAKASH-Sultan Chand,(2005).
7. Nuclear physics by Devanathan.V. Narosa publishers (2006)
8. Introduction to Nuclear Physics- Harald Enge Addison-Wesley Publishing Company.(1996)
9. Nuclear Physics-C.L.Arora—S.Chand and company Ltd.(1999).

Web Resources:

1. https://houseofphy.blogspot.in/ModernPhysicsNotes(HRK)ByMuhammadAliMalik
2. http://www.freebookcentre.net/Physics/Modern-Physics-Books.htmlnuclearPhysicsbooks
3. http://www.freebookcentre.net/Physics/Nuclear-Physics-Books.html
4. http://www.freebookcentre.net›Physics›Theoretical.

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic concepts of nucleus and its properties	K_1
CO2	**Discuss** the concepts of nuclear reactions	K_2
CO3	**Solve** Nuclear problem with analytical thinking	K_3
CO4	**Analyze** the different theories involved in nuclear reactions	K_4
CO5	**Predict** the mechanism involved in nuclear reactors and its effects	K_6

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	S	S	S	M
CO 3	S	S	S	M	S
CO 4	S	S	S	S	M
CO5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title : MATHEMATICAL PHYSICS Hours/Week : 5
Course Code : 22UPHC13 Credits : 5
Semester : VI

Course Objective:

The aim of the course is to provide extensive mathematical formalism for understanding and interpreting various physical problems.

SYLLABUS

UNIT – I (Hours: 15)

MATRICES

Solutions of linear equations–Cramer's rule–Cayley–Hamilton theorem - Inverse of a matrix- characteristic matrix and characteristic equations of a matrix Eigenvalues and eigenvectors–Diagonalisation of 3x3 symmetric matrices using orthogonal transformation.

UNIT – II (Hours: 15)

VECTOR ANALYSIS

Gradient, divergence and curl of vector point function – Solenoidal and irrotational – Integration of vectors – Line, surface and volume integrals – Gauss theorem – statement and proof - Applications of Gauss theorem–Equation of continuity and Euler's equation of motion.

UNIT – III (Hours: 15)

FOURIER AND LAPLACE TRANSFORMS

Fourier Transform – Properties of Fourier Transform –Finite and Infinite Fourier sineandcosineTransform–ApplicationsofFourierTransform–EvaluationofIntegrals –Solution of boundary value problems.

Laplace Transform–Applications of Laplace Transform–Evaluation of definite integrals – Solution of differential equations – Ordinary differential equation with constant coefficients – Ordinary differential equation with variable coefficient –Solution of integral equation–Solution of boundary value problem.

UNIT – IV (Hours: 15)

BETA, GAMMA AND ERROR FUNCTIONS

Definition of Beta and Gamma functions-relation between beta and gamma functions – properties - Transformation of gamma function – Evaluation of definite integrals in terms of Beta and gamma functions–Applications-Error function–Evaluation of error function.

UNIT – V (Hours: 15)

COMPLEX VARIABLES

Functions of a complex variable – Continuity of a function of two real variables – Analytic function – Cauchy-Riemann equation – Necessary conditions for f(z) to be analytic – Properties of analytic function.

Book for Study:

1. Mathematical Physics -B.D.Gupta, Vikas Publishing House, New Delhi,(2008).
2. Mathematical Physics-Satyaprakash, Sultan Chand &Sons, NewDelhi,(2010).
3. Statistics-N.P.Bali, Golden Maths Series, Laxmi Publications,(1994).
4. Mathematical Physics- H.K.Dass, S.Chand & Co,(2014).
5. Mechanics and Mathematical Methods–R.Murugeshan, S.Chand &Co,(2005).

Books for Reference:

1. Mathematical Methods for Physicists - G. Arfken and H.J. Weber, 4th ed. Prism Books, Bangalore,(1995).
2. Advanced Engineering Mathematics-M.D.Greenberg, 2nd ed. International ed., Prentice–Hall International NJ,(1998).
3. Advanced Engineering Mathematics-E.Kreyszig,8thed.Wiley,NY,(1999).
4. A text book of Mathematical Physics – Suresh Chandra, Narosa Publishing House,(2009).
5. Mathematical Physics–A.K.Saxena, Narosa Publishing House,(2015).

Web Resources:

1. Mathematical Tools for Physics,www.physics.miami.edu/nearing/mathmethods/mathematical_methods-three.pdf
2. https://nptel.ac.in/courses/115/103/115103036/
3. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-ph06/

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Recall** the basic formulae in mathematical physics	K_1
CO2	**Summarize** the concepts of mathematical physics	K_2
CO3	**Implement** vectors, Fourier and Laplace Transforms and special functions to solve problems	K_3
CO4	**Examine** the given problem to find an appropriate solution	K_4
CO5	**Evaluate** the problems using the theorems in mathematical physics	K_5

Mapping of COs with POs

CO	PO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	S	S	S	S
CO2	S	M	S	S	S
CO3	S	L	M	M	S
CO4	S	L	S	S	S
CO5	S	S	S	M	S

Programme Title : B.Sc. Physics
Course Title : Elective – III: DIGITAL ELECTRONICS Hours/Week : 5
Course Code : 22UPHEC3 Credits : 5
Semester : VI

Course Objective:

To understand Binary number system, Boolean algebra, logic gates, combinational logic, sequential logic, analyse and construct the counter circuits.

SYLLABUS

UNIT – I (Hours: 15)

BINARY SYSTEMS AND BOOLEAN ALGEBRA

Binary number system - Number base conversions - Octal and Hexa decimal numbers – Binary addition and subtraction-Complements -1's and 2's complement addition and subtraction –Binary codes - BCD code - Excess-3 code - gray codes - Boolean algebra - Basic definitions and properties of Boolean algebra-Demorgan's theorem-proof.

UNIT – II (Hours: 15)

DIGITAL LOGIC GATES, LOGIC FAMILIES AND BOOLEAN FUNCTIONS

Basic logic gates - Universal gates - Ex-OR gate -IC digital logic families(DTL,TTL&ECL) - Boolean functions - sum of product simplification(SOP) - Product of sums simplification (POS) - Minterms and Maxterms- Karnaugh Map method - Two and Three variable maps - Four variable map -Don't care conditions.

UNIT – III (Hours: 15)

COMBINATIONAL LOGIC

Introduction - Design procedure - Half and Full adders - Half and Full Subtractors-BCD-to-Excess-3 code conversion- BCD adder - Magnitude comparator - Encoders -Decoders – Multiplexers and Demultiplexers.

UNIT – IV (Hours: 15)

SEQUENTIAL LOGIC

Flip flops - SR Flip flop - Clocked SR Flip flop - JK Flip flop –D-Flip flop - T-Flip flop - Timing diagram - Master Slave Flip flops - Registers - Shift registers - Parallel in Parallel out (PIPO) - Serial in Parallel out (SIPO).

UNIT – V (Hours: 15)

COUNTERS

Counters - Ripple counters – Design of Synchronous counters and Asynchronous counters- Synchronous BCD decade counter - design of mod 3, mod 6, mod 8 counters - Up-down counter.

Book for Study:

1. Digital circuits and Design-S.Salivahanan & S.Arivazhagan, Vikas publishing house PVT., LTD.(2018).
2. Introduction to Integrated Electronics Digital &Analog-V.Vijayendran, S.Viswanathan (Printers and Publishers), PVT., LTD. (2007).
3. Digital Fundamentals- Floyd & Jain Published by Dorling Kindersley (India) Pvt.Ltd, 8th Edition, (2009).

Books for Reference:

1. Electronics Fundamental and applications - D.Chattopadhya, New Age International (P) Ltd, 5th Edition, (2003).
2. Modern digital electronics - R.P. Jain, McGraw- Hill education, 2003.
3. Applied Electronics - A. Subramaniyam, National Publishing Company, 2nd Edition, 2003.

Web Resources:

1. http://www.inf.fu-berlin.de/lehre/WS00/19504-V/Chapter1.pdf
2. https://www.eecs.tufts.edu/~dsculley/tutorial/flopsandcounters/flopsFrame.html

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Remember** the concepts and terminology of digital electronics.	K_1
CO2	**Understand** the concepts of the Binary systems, boolean algebra and karnaugh map.	K_2
CO3	**Application** of logic to design the gates, combinational, Sequential and counter circuits.	K_3
CO4	**Evaluate** the algebraic representation of logic circuits using DeMorgan's theorems.	K_5

Mapping of COs with POs

CO	PO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	M	S	M	S
CO 2	S	M	S	S	M
CO 3	S	S	M	S	M
CO 4	S	S	S	M	S

Programme Title : B.Sc. Physics
Course Title : Elective – III: ENVIRONMENTAL PHYSICS Hours/Week : 5
Course Code : 22UPHSEC3 Credits : 5
Semester : VI

Course Objective:

The aim of the course is to enable the students to acquire the basic knowledge of the environment and it covers energy exploitation, climatic changes, pollution, interaction of electromagnetic fields and nuclear radiations with matter and environmental policy.

SYLLABUS

UNIT – I (Hours: 15)

ESSENTIALS OF ENVIRONMENTAL PHYSICS

The economic system - Living in the green house – Enjoying the sun- transport of matter, Energy and momentum - The Global climate - The energy balance – a Zero – Dimensional greenhouse model – Radiative forcing – Elements of weather and climate - Reynold's number.

UNIT – II (Hours: 15)

BASIC ENVIRONMENTAL SPECTROSCOPY

Introduction to the solar spectrum - Blackbody radiation - The emission spectrum of the sun – Interaction of light with matter – The transition electric dipole moment – The Einstein coefficients – Lambert – Beer's law – Bio molecules, Ozone & UV light – The spectroscopy of bio molecules – Solar – UV and life - The ozone filter.

UNIT – III (Hours: 15)

ENVIRONMENTAL CHANGES

Renewable energy sources – Solar heat and Solar electricity – Solar collectors – Electricity by solar heat – wind energy – Betz limit – waves – Converters – Bio energy – Efficiency – Hydropower – Fuel cells – Nuclear energy – Power from Nuclear fission and fusion – Radiation and safety (Qualitative study only).

UNIT – IV (Hours: 15)

TRANSPORT OF POLLUTANTS

Diffusion – Flow in rivers – ground water flow – the equations of fluid dynamics - turbulence – Turbulent diffusion – Gaussian plumes in the air – Turbulent jets and plumes.

UNIT – V (Hours: 15)

NOISE

Basic Acoustics – Velocity of sound – wave equation – Human perceptions and noise criteria – loudness – Reducing the transmission of sound – Active control of soun

Book for Study:

1. Egbert Boeker and Rienk Van Groundelle, Environmental Physics - John Wiley.

Books for Reference:

1. J.T.Widdell and J.Weir, Renewable energy resources - ELBS (1988).

2. J.T.Hougton, The Physics of Atmosphere - Cambridge university press (1977).

Web Resources:

1. www.imperial.ac.uk
2. http://djelatnici.unizd.hr

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Create awareness and develop basic skills about environment and energy resources.	K_6
CO2	Acquire working knowledge on environmental spectroscopy and apply it in to day-to-day life	K_2, K_4
CO3	Evaluate the various environmental changes qualitatively.	K_5
CO4	Analyze the various transport pollutants, creates concern among the students on energy conservation and environmental protection.	K_2, K_3
CO5	Understand the characteristics of sound and requisites of good acoustics.	K_2

Mapping of COs with POs

	PO				
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CO 1	S	S	S	S	S
CO 2	S	M	S	S	S
CO 3	S	S	S	S	S
CO 4	S	M	S	S	S
CO 5	S	S	S	S	S

Programme Title : B.Sc. Physics
Course Title :NMSB – II : PHYSICS IN EVERYDAY LIFE
Course Code : 22UPHNSC2 **Hours/Week : 2**
Semester : VI **Credits : 2**

Course Objective:

The aim of the course is to impart knowledge about the working principles and mechanisms of the things and phenomena around us.

SYLLABUS

UNIT– I (Hours: 6)

MECHANICS

Motion, Force and Newton's laws – Momentum - Projectile and Circular motions - Gravitation - Planetary motion - Rotational motion - Earth satellites - Communication satellites.

UNIT – II (Hours: 6)

PROPERTIES OF MATTER

Three states of matter – Elasticity - Hooke's law – Moduli of elasticity – Pascal's law - Archimedes Principle – Capillary action- Bernoulli's Principle -Viscosity.

UNIT – III (Hours: 6)

HEAT

Measurement of heat and temperature – Clinical thermometer – Heat transfer – Thermos flask – Change of state – Effect of pressure on melting point and boiling point-Regelation-Superheating-Super cooling.

UNIT – IV (Hours: 6)

OPTICS

Light – Optical instruments – Camera – Telescope – Microscope – Projector – Basic principles (No derivation)- Lasers- Principle- Spontaneous and Stimulated emission of radiation-Kinds of lasers and its uses (qualitative study only).

UNIT – V (Hours: 6)

SOUND AND ELECTRICITY

Sound and music – Reverberation – Acoustics of building – Recording and reproduction of sound in film-Elementary idea.

Coulomb's law– Electric potential – Capacitor – Principle – Capacitors in series and parallel – Current and resistance, Equation of continuity- ohm's law.

Book for Study:

1. Fundamentals of physics – Halliday, Resnick, Walker, 6th Edition Wiley (2008).
2. Heat and Thermodynamics – Brijlal and N.Subramaniam, S.Chand & Co., (2002).
3. A Text book of Optics –Brijlal and N.Subramaniam, 23ed Edition S.Chand & Co., (2006).

Books for Reference:

1. Mechanics by Brijlal & Subramaniam, S.Chand & Co.
2. Applied Physics – M. Arumugam, Educational PUB (1999).
3. Allied Physics –Ponnuswamy
4. Electricity and Magnetism, R. Murugeshan 6th Edition S.Chand & Co., (2001).

Web Resources:

1. https://web.uri.edu/newstudent/files/StudyTipsPhysics.pdf

Course Outcomes: On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	**Define** the basic principles of Physics	K_1
CO2	**Summarize** the concepts of Properties of matter, Mechanics, Heat and Light	K_2
CO3	**Apply** the fundamentals of Physics to real life situations	K_3
CO4	**Analyze** the characteristics of sound and the requisites of good acoustics	K_4
CO5	**Discuss** the working principles and mechanism of things around us	K_5