PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR
SALEM – 636011

DEGREE OF BACHELOR OF SCIENCE
CHOICE BASED CREDIT SYSTEM

Syllabus for
B.Sc., PHYSICS

(SEMESTER PATTERN)

(For Candidates admitted in the College affiliated to Periyar University from 2021-2022 onwards)

B.Sc - PHYSICS SYLLABUS

PROGRAMME OBJECTIVES

Mentor the young students to face global challenges with unique proficiency in Physics.

To apply basic Physics principles in everyday life.

Promote analytical thinking and experimental skills in Physics.

PROGRAMME OUTCOMES

Acquire academic excellence with an aptitude for higher studies and research.

Apply appropriate scientific methods and modern technology to solve complex problems related to society.

REGULATIONS

1. ELIGIBILITY

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

2. DURATION OF THE COURSE

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

3. COURSE OF STUDY AND SCHEME OF EXAMINATION

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time. The scheme of examination of the different semester shall be as follows;

Total Marks	**:**	**4200**
Part I	:	400
Part II	:	400
Part III	:	2200
Part IV	:	1200

Total Credits	**:**	**157 + EC***
Part I	:	12
Part II	:	12
Part III	:	102
Part IV	:	31
Part V	:	Extra Credits*

***Extra credits:** SWAYAM/ NPTEL etc., (online courses), Internship & Extension activities. (Not considered for Grand Total and CGPA)

COURSE OF STUDY AND SCHEME OF EXAMINATION

Part	Paper Code	Subject Title	Hours/week	Exam Hrs.	Credits	University Examination			Page No.
						Internal	External	Total	
SEMESTER I									
I	**21UFTA01**	Language – I	**6**	**3**	**3**	**25**	**75**	**100**	
II	**21UFEN01**	English – I	**6**	**3**	**3**	**25**	**75**	**100**	
III	**21UPH01**	Core Physics – I	**5**	**3**	**5**	**25**	**75**	**100**	**11**
		(Properties of Matter and Acoustics)							
III	**21UPHP01**	Core Physics Practical – I*	**3**	**3**	**-**	**-**	**-**	**-**	**16**
III	**21UMAA01**	Allied Mathematics – I (Theory)	**4**	**3**	**4**	**25**	**75**	**100**	
III	**21UMAAP01**	Allied Mathematics (Practical)*	**2**	**3**	**-**	**-**	**-**	**-**	
IV	**21UEV01**	Value Education	**1**	**3**	**1**	**25**	**75**	**100**	
IV	**21UPEN01**	Professional English – I	**3**	**3**	**4**	**25**	**75**	**100**	
SEMESTER II									
I	**21UFTA02**	**L**anguage – II	**6**	**3**	**3**	**25**	**75**	**100**	
II	**21UFEN02**	English – II	**4**	**3**	**3**	**25**	**75**	**100**	
II	**Naan Mudhalavan Skill based Courses**	**Language Proficiency for Employability**	**2**	**3**	**2**	**25**	**75**	**100**	
III	**21UPH02**	Core Physics II (Mechanics)	**5**	**3**	**5**	**25**	**75**	**100**	**14**
III	**21UPHP01**	Core Physics Practical – I*	**3**	**3**	**5**	**40**	**60**	**100**	**16**
III	**21UMAA02**	Allied Mathematics – II (Theory)	**4**	**3**	**4**	**25**	**75**	**100**	
III	**21UMAAP01**	Allied Mathematics Practical *	**2**	**3**	**4**	**40**	**60**	**100**	
IV	**21UVE01**	Environmental Studies	**1**	**3**	**1**	**25**	**75**	**100**	
IV	**21UPEN01**	Professional English –II	**3**	**3**	**4**	**25**	**75**	**100**	

* Continued from I semester and Examinations will be at the end of II semester									
Part	**Paper Code**	**Subject Title**	**Hours/week**	**Exam Hrs.**	**Credits**	**University Examination**			**Page No.**
						Internal	**External**	**Total**	
SEMESTER III									
I	**21UFTA03**	Language – III	**6**	**3**	**3**	**25**	**75**	**100**	
II	**21UFEN03**	English – III	**6**	**3**	**3**	**25**	**75**	**100**	
III	**21UPH03**	Core Physics – III	**5**	**3**	**5**	**25**	**25**	**100**	**18**
		(Thermal and Statistical Physics)							
III	**21UPHP02**	Core Physics Practical – II*	**3**	**3**	**-**	**-**	**-**	**-**	**22**
III	**21UCHA01**	Allied Chemistry– I (Theory)	**4**	**3**	**4**	**25**	**75**	**100**	
III	**21UCHAP01**	Allied Chemistry Practical*	**2**	**3**	**-**	**-**	**-**	**-**	
IV	**(Student's choice)**	Non-Major Elective Course –I	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**NMSDC**	**Digital Skill for Employability - Microsoft Office Essentials**	**2**	**-**	**2**	**100**	**-**	**100**	**51**
V	**Online course**	SWAYAM / NPTEL etc.,**	**-**	**-**	**2**	**-**	**-**	****	
SEMESTER IV									
I	**21UFTA04**	Language – IV	**6**	**3**	**3**	**25**	**75**	**100**	
II	**21UFEN04**	English – IV	**6**	**3**	**3**	**25**	**75**	**100**	
III	**21UPH04**	Core Physics – IV	**5**	**3**	**5**	**25**	**75**	**100**	**20**
		(Optics and Spectroscopy)							
III	**21UPHP02**	Core Physics Practical – II*	**3**	**3**	**5**	**40**	**60**	**100**	**22**
III	**21UCHA02**	Allied Chemistry– II (Theory)	**4**	**3**	**4**	**25**	**75**	**100**	
III	**21UCHAP01**	Allied Chemistry Practical *	**2**	**3**	**4**	**40**	**60**	**100**	
IV	**(Student's choice)**	Non-Major Elective Course II	**2**	**3**	**2**	**25**	**75**	**100**	
IV	**Naan Mudhalavan Skill based Courses**	Digital Skills for Employability-Office Fundamentals	**2**	**3**	**2**	**100**	**-**	**100**	
V	**21UPHIS01**	Internship ***	**-**	**-**	**2**	**-**	**-**	**-**	

*** Continued from III semester and Examinations will be at the end of IV semester.**
**** Students should submit their online course certificates at the end of the VI**

	semester(8 to 12 weeks - 2 credit/per course will be allotted).								
	***** The students should undergo compulsory 2 weeks internship programs during the IV semester vacation. At the end of the program, students should submit the report.**								
Part	**Paper Code**	**Subject Title**	**Hours/week**	**Exam Hrs.**	**Credits**	**University Examination**			**Page No.**
						Internal	**External**	**Total**	
		SEMESTER V							
III	**21UPH05**	Core Physics V	**5**	**3**	**5**	**25**	**75**	**100**	**24**
		(Electricity and Magnetism)							
III	**21UPH06**	Core Physics – VI (Solid State Physics)	**5**	**3**	**5**	**25**	**75**	**100**	**26**
III	**21UPH07**	Core Physics – VII	**5**	**3**	**5**	**25**	**75**	**100**	**28**
		(Analog and Digital Electronics)							
III	**21UPHE01/**	Elective – I	**5**	**3**	**4**	**25**	**75**	**100**	**43/**
	21UPHE02	(Materials Science / Astrophysics)							**45**
III	**21UPHP03**	Core Physics Practical – III*	**3**	**3**	**-**	**-**	**-**	**-**	**39**
III	**21UPHP04**	Core Physics Practical – IV*	**3**	**3**	**-**	**-**	**-**	**-**	**41**
IV	**21UPHS02**	Skill-based Elective course – II	**2**	**3**	**3**	**25**	**75**	**100**	**55**
		Computational methods and programming in-C							
IV	**NMSDC**	**Technical Skills for Employability – Fundamentals of Data Analytics with Tableau**	**2**	**3**	**3**	**25**	**75**	**100**	**57**
		SEMESTER VI							
III	**21UPH08**	Core Physics - VIII (Atomic Physics)	**5**	**3**	**5**	**25**	**75**	**100**	**31**
III	**21UPH09**	Core Physics - IX (Nuclear Physics)	**5**	**3**	**5**	**25**	**75**	**100**	**34**
III	**21UPH10**	Core Physics – X (Quantum Mechanics and Relativity)	**5**	**3**	**5**	**25**	**75**	**100**	**37**
III	**21UPHE03 / 21UPHE04**	Elective – II (Energy Physics / Electronic Communication Systems)	**5**	**3**	**4**	**25**	**75**	**100**	**47/ 49**
III	**21UPHP03**	Core Physics Practical – III*	**3**	**3**	**5**	**40**	**60**	**100**	**39**
III	**21UPHP04**	Core Physics Practical – IV*	**3**	**3**	**5**	**40**	**60**	**100**	**41**
IV	**21UPHS04**	Skill-based Elective course IV Microprocessor and its Applications	**2**	**3**	**3**	**25**	**75**	**100**	**61**
III	**Elective Naan Mudhalavan Skillbased**	**Emerging Technology for Employability**	**2**	**3**	**2**	**25**	**75**	**100**	

	Courses								
V	**21UEX01**	Extension activities	**-**	**-**	**1**	**-**	**-**	**-**	
***Continued from V semester and examinations will be at the end of VI semester**									

*** Continued from I semester and Examinations will be at the end of II semester**

*** Continued from III semester and Examinations will be at the end of IV semester.**

**** Students should submit their online course certificates at the end of the VI semester (8 to 12 weeks - 2 credit/per course will be allotted).**

***** The students should undergo compulsory 2 weeks internship programs during the IV semester vacation. At the end of the program, students should submit the report.**

***Continued from V semester and examinations will be at the end of VI semester**

Elective – I (V-Semester**)**

1. Materials Science (**21UPHE01)**
2. Astrophysics (**21UPHE02)**

Elective - II (VI- Semester**)**

1. Energy Physics (**21UPHE03)**
2. Electronic Communication systems (**21UPHE04)**

Skill-based Elective Courses (SBEC)

1. Career competency skills-I (**21UPHS01)**
2. Computational Methods and Programming in - C (**21UPHS02)**
3. Instrumentation **(21UPHSO3)**
4. Microprocessor and its applications (**21UPHS04)**

Naan Mudhalavan Skill based Courses

1. Language Proficiency for Employability **(Semester II)**
2. Digital Skills for Employability **(Semester IV)**
3. Emerging Technology for Employability **(Semester VI)**

Non – Major Elective Courses

1. Physics in Everyday life - **Semester – III (21UPHN01)**
2. Non-renewable Energy sources - **Semester – IV (21UPHN02)**

4. EXTENSION ACTIVITY/ FIELD VISIT IS MANDATORY

A visit to a factory, farm, or museum is mandatory for purposes of firsthand observation.

5. EXAMINATIONS

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

6. PASSING MINIMUM

1. Theory

Continuous Internal Assessment (CIA): 25 marks **University Examination (UE)**: 75 marks

Evaluation of CIA		**Passing minimum**	
Tests	- 15 marks		
Assignment/Seminar/Field Trip*	- 05 marks		
Attendance	- 05 marks		
Total (CIA)	= 25 marks	**No minimum marks**	
Evaluation of UE	= 75 marks	UE (40%)	= 30 marks
Total	**= 100 marks**	40 %	**= 40 marks**

***CIA for SBEC :** 5 Marks may be awarded for submission of field visit / Industrial visit / assignment.

2. Practical

Continuous Internal Assessment (CIA): 40 marks **University Examination (UE)**: 60 marks

Evaluation of CIA		**Passing minimum**	
Observation	- 15 marks		
Model Exam	- 20 marks		
Attendance	- 05 marks		
Total	= 40 marks	**No minimum marks**	
UE	= 60 marks	UE (40%)	= 24 marks
Total	**= 100 marks**	40 %	**= 40 marks**

University Examination: 60 Marks

Evaluation for university practical examinations

Record Marks**	- 10 Marks
Formula with expansion	- 5 Marks
Observations with data	- 20 Marks
Calculation	- 15 Marks
Result with units	- 05 Marks
Viva – voce	- 05 Marks

**** Submission of record with due certification is a must for external practical examination.
** A student should complete all the required experiments to get 10 marks for the record.

7. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain **75% and above** of the marks in the aggregate shall be deemed to have passed in **First Class with Distinction** provided they pass all the examinations prescribed for the course at first appearance. Candidates who secure not less than **60%** of the aggregate marks in the whole examination shall be declared to have passed in **First Class**. Candidates to secure not less than 50% shall be declared to have passed in **Second Class**. **All other successful candidates** shall be declared to have passed in **third class**.

Letter Grade	Cumulative Grade Points Average	Grade Description	Range of Marks
S	10	Outstanding	90-100
A	9	Excellent	80-89
B	8	Very Good	70-79
C	7	Good	60-69
D	6	Average	50-59
E	5	Satisfactory	40-49
RA	0	Re-Appear	0-39

$$GP = \frac{(\text{Marks obtained in course X Credit})}{100}$$

$$GPA = \frac{\text{Total Grade Points earned in a semester}}{Total\ Credit\ registered\ in\ a\ Semester}$$

$$GPA = \frac{\text{Sum of Grade Points earned}}{Total\ credit\ registered\ in\ a\ semester}$$

CLASSIFICATION:

CGPA	7.5 and above	I Class with Distinction
CGPA	Between 6 and 7.4	I Class
CGPA	Between 5 and 5.9	II Class
CGPA	Between 4 and 4.9	III Class

8. RANKING

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

9. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAM

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

10. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2021-2022 and thereafter.

11. TRANSITORY PROVISION

Candidates who were admitted to the UG course of study before 2021-2022 shall be permitted to appear for the examinations under those regulations for three years i.e., up to and inclusive of the examination of April/May 2024. Thereafter they will be permitted to appear only under regulations then in force.

12. QUESTION PAPER PATTERN

(University Exam)

Duration: 3 Hours **Maximum Marks – 75 Marks**

Part A: 15 X 1 = 15 Marks (Answer all questions)

Multiple Choice Questions – with four options (Three questions from each unit)

Part B: 2 X 5 = 10 Marks (Answer any two questions out of five questions)

One question from each unit - (**Out of five questions, two questions must be the problem**)

Part C: 5 X 10 = 50 Marks (Answer all questions)

One question from each unit - (Either or type)

CORE PHYSICS I - PROPERTIES OF MATTER AND ACOUSTICS

SEMESTER	**: I**	**HOURS/WEEK**	**: 5**
SUBJECT CODE	**: 21UPH01**	**CREDITS**	**5**

OBJECTIVES

- To impart the basic concepts of properties of matter to make the students realize the concepts in day-to-day life.
- To study the basics of viscosity and its importance.
- To learn and comprehend the concepts of surface tension.
- To enable the students to understand waves and oscillations to make them appreciate the flavour of physics in sound.
- To enable the students to understand the Acoustic aspects of halls and auditoria and Ultrasonic.

LEARNING OUTCOMES

- Students understand the behaviour and properties of solids and fluids.
- Students will able to acquire knowledge about viscosity and lubrication.
- Students will have a strong knowledge of surface tension.
- Students will get an overview of the fundamental principles of waves and oscillations.
- To study and apply the knowledge of Acoustics aspects of halls and auditorium and understand Ultrasonic and its application in various field.

UNIT I ELASTICITY

Bending of beams– Expression for bending moment -Young's modulus - theory and experiment (uniform and non–uniform bending) - using pin and microscope method- I - section Girders Cantilever–Depression of the loaded end of a Cantilever - experimental determination scale and telescope method - Torsion of a body – expression for a couple per unit twist – work done in twisting a wire - determination of rigidity modulus – Static torsion method with scale and telescope –Torsional pendulum – rigidity modulus and moment of inertia.

UNIT II VISCOSITY

Definition of Coefficient of viscosity with unit and dimension –Streamline and turbulent flow - expression for critical velocity–Poiseuille's formula for the coefficient of viscosity and its correction– determination of coefficient of viscosity by capillary flow method (Poiseuille's method) – comparison of viscosities by Ostwald's viscometer – Variations of viscosity of a liquid with temperature - lubrication- applications of viscosity.

UNIT III SURFACE TENSION

Definition of surface tension with unit and dimension– Molecular theory – Surface energy – formation of drops– the angle of contact – excess of pressure inside and over curved surfaces- application to cylindrical and spherical drops and bubbles – Experimental determination of surface tension (Jaeger's method) – drop weight method of determining surface tension and interfacial surface tension – determination surface tension by Quincke's method - a variation of surface tension with temperature.

UNIT IV WAVES AND OSCILLATIONS

Simple harmonic motion - Free, Damped, Forced vibrations and Resonance - Sharpness of resonance Phase of resonance – Quality factor- Examples of forced and resonant vibration - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity & loudness of sound - Decibels - Intensity levels - Noise pollution.

UNIT V ACOUSTICS &ULTRASONICS

Acoustics: Musical sound – characteristics of musical sound and noise - reverberation and time of reverberation –derivation of Sabine's formula –determination of absorption coefficient - Acoustic aspects of halls and auditoria.

Ultrasonic – Production – Piezoelectric method – magnetostriction method – detection methods – properties – applications.

BOOKS FOR STUDY

1. D.S. Mathur, Elements of properties of matter, S.Chand & Company Ltd., New Delhi (2010).
2. R. Murugeshan, Properties of matter and acoustics, S. Chand & Co, New Delhi (2012)
3. Brij Lal and N. Subrahmanyam, Properties of matter, Eurasia Publishing House Limited (2005)
4. N. Subrahmanyam and Brij Lal, A Text Book of Sound, Vikas Publication House Pvt Ltd, New Delhi (1999).

BOOKS FOR REFERENCE

1. Richard P. Feynman, Lectures on Physics. Vol. I & II, The New Millennium Edition (2012)
2. David Halliday and Robert Resnick, Fundamentals of Physics, Wiley Plus, (2013)
3. B.H. Flowers and E. Mendoza, Properties of Matter, Wiley Plus, 1991.
4. H.R. Gulati, Fundamentals of General properties of matter, S. Chand 2012.
5. Hugh D. Young and Roger A. Freedman, Sears & Zemansky's University Physics with Modern Physics, 14th Edition (2015)

WEBSITES FOR REFERENCE

1. https://physics.info/elasticity/
2. https://silver.neep.wisc.edu/~lakes/PoissonIntro.html
3. https://www.insula.com.au/physics/1279/L7.html
4. https://schools.aglasem.com/46834
5. https://schools.aglasem.com/47259
6. https://www.askiitians.com/physics/mechanics/surface-tension.aspx
7. https://hyperphysics.phy-astr.gsu.edu/hbase/pbuoy.html

PEDAGOGY: Chalk and talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation etc.

CORE PHYSICS II - MECHANICS

SEMESTER	**: II**	**HOURS/ WEEK**	**:5**
SUBJECT CODE	**: 21UPH02**	**CREDITS**	**:5**

OBJECTIVES

- To know the fundamentals of projectile motion, the centre of gravity, SHM, Hydrostatics and Dynamics of rigid bodies.
- To provide the basis of the classical approach of Lagrangian Mechanics.

LEARNING OUTCOMES

- Learn to solve the problems in projectile motion.
- Understand the concepts of rigid body dynamics in terms of the moment of inertia.
- Acquire knowledge of Lagrangian formulation in classical mechanics.

UNIT I

PROJECTILE: Definition of Range, Time of flight and Angle of projection –Range up and down an inclined plane maximum range – two directions of projections for a given velocity and range.

IMPACT: Laws of impact – coefficient of restitution – the impact of a smooth sphere on a fixed smooth plane – Direct impact between two smooth spheres – Loss of kinetic energy indirect impact – velocity change in oblique impact between two smooth spheres-Loss of kinetic energy in an oblique impact.

UNIT II

CENTRE OF GRAVITY: Definition - Centre of gravity of a solid cone, Solid hemisphere, hollow hemisphere and a tetrahedron – Centre of Buoyancy.

FRICTION: Introduction – Static, Dynamic, Rolling and Limiting Friction - Laws of friction – the angle of friction – resultant reaction and cone of fiction – equilibrium of a body on an inclined plane under the action of a force.

UNIT III

SIMPLE HARMONIC MOTION: Composition of two SHM's of same period along a straight line and at the right angles to each other –Lissajou's figures – Experimental methods for obtaining Lissajou’s figures – Applications.

RIGID BODY DYNAMICS: Compound pendulum - Centers of oscillation and suspension - determination of g and k - Bifilar pendulum - Parallel and non-parallel threads - Centre of mass - Conservation of linear and angular momentum - Variable mass Rocket propulsion.

UNIT IV

HYDROSTATICS: Concurrent forces - Parallel forces –couple - static equilibrium of rigid body - the centre of pressure of rectangular and triangular lamina - Metacentric height and its determination.

HYDRODYNAMICS: Equation of continuity of flow – Euler's equation of unidirectional flow - Torricelli's theorem - Bernoulli's theorem and its applications – Venturimeter.

UNIT V

LAGRANGIAN DYNAMICS: Mechanics of system of particles – Conservation of energy - Constraints of motion Generalized coordinates and the transformation equation - simple illustration for the transformation equation – Configuration space - the principle of virtual work – D'Alembert's principle - Lagrange's formulation for conservation theorems – Hamiltonian-Hamilton's Equation.

BOOKS FOR STUDY

1. R. Murugeshan, Mechanics and Mathematical Physics, S.Chand& Company Ltd, 2008, 3rd Edn.
2. M. Narayanamurthi and N. Nagarathinam Dynamics, The National Publishing Company 2008, 8rd Edn.

BOOKS FOR REFERENCE

1. Herbert Goldstein Classical Mechanics Addition Wesley Publications, 2005.
2. D.S. Mathur, Mechanics, S.Chand& Company Ltd., 2000, 3rd Edn.
3. The Feynman Lectures on Physics, Volumes 1 & 1, Narosa Publishing House, 1998
4. Murray R. Spiegel, Theoretical Mechanics, Schaum's Outline Series, McGraw-Hill Book Co, SI (Metric) Edition, 1987

PEDAGOGY: Chalk and talk lectures, Group Discussion, Seminar, Interaction and Powerpoint Presentation etc.

CORE PHYSICS PRACTICAL I

SEMESTER	**: I & II**	**HOURS/WEEK**	**: 3**
SUBJECT CODE	**: 21UPHP01**	**CREDITS**	**: 5**

OBJECTIVES

To understand and apply the principle of physics by doing related experiments in properties of Matter, Optics, Electricity and Basic Electronics.

LIST OF EXPERIMENTS (ANY FOURTEEN ONLY)

1. Compound Pendulum-Determination of g and k.
2. Young's modulus (q) - Non-uniform bending - pin and microscope- unknown mass.
3. Young's modulus (q) - Uniform bending - Optic lever method- scale and telescope - unknown mass.
4. Rigidity modulus – Static torsion apparatus - unknown mass.
5. Coefficient of Viscosity - graduated burette and radius by mercy pellet method.
6. Surface Tension- Capillary rise method.
7. Sonometer - frequency of a tuning fork and- R.D of solid and liquid.
8. Specific heat capacity of solids by the method of mixtures-Half time correction.
9. Coefficient of Thermal conductivity of bad conductor-Lees disc method.
10. Spectrometer-Refractive Index of a solid prism.
11. Spectrometer-Grating – Normal incidence – Determination of wavelength of mercury spectral lines.
12. Potentiometer-low range voltmeter calibration.
13. Potentiometer-low range ammeter calibration.
14. Post Office Box- Energy bandgap of a thermistor.
15. Moment of a magnet - deflection magnetometer - TANC position.
16. Moment of magnet- circular coil – Deflection magnetometer.
17. Low range power pack.
18. Junction and Zener diode characteristics.
19. Logic gates using IC's – truth table verification (AND, OR, NOT, NAND, NOR, EXOR)
20. Transistor characteristics –CE configuration.

BOOKS FOR STUDY AND REFERENCE

1. M.N.Srinivasan, S. Balasubramanian, R. Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan Chand and sons educational publishers, New Delhi. Edition 2017
2. M.K Subramanian, S.Padmanathan, S.Somasundaram, B.Sc Practical Physics, Apsara Publications, Trichy, revised edition 2020.
3. C.C.Ourseph, C.Rangarajan, R. Balakrishnan – A Text Book of Practical Physics – S.Viswanathan Publisher – Part II (1996)
4. S.L. Gupta and V.Kumar – Practical Physics – Pragati Prakashan – 25th Edition (2002)

PEDAGOGY: Demonstration and practical Sessions.

CORE PHYSICS III - THERMAL AND STATISTICAL PHYSICS

SEMESTER : III **HOURS/WEEK : 5**

SUBJECT CODE : 21UPH03 **CREDITS 5**

OBJECTIVES

- Understand the Thermodynamical laws, potential and functions.
- Understand the statistical physics

LEARNING OUTCOMES

Students will gain profound knowledge in specific heat, thermodynamics functions, potentials and transfer of heat. These concepts will leads to understanding the application of thermodynamics and statistical physics.

UNIT I HEAT

Concept of Heat and Temperature- Thermometry - types of Thermometer - Platinum Resistance thermometer – calorimeter - Specific Heat Capacity of liquid by Newton's law of cooling - specific heat capacities of gas – Determination of C_v by Joly's method – Determination of C_p by Regnault's method.

Low - temperature physics – Joule Thomson Effect – porous plug theory and experiment – liquefaction of gases by Linde's process – liquefaction of hydrogen – liquefaction of helium by Kammerlingh Onne's method – Helium I and II – Adiabatic Demagnetisation – Electrolux refrigerator.

UNIT II THERMODYNAMICS

Thermodynamics – Zeroth and the first law of thermodynamics – Application of first law of thermodynamics – Adiabatic equation of a perfect gas – Determination of γ by Clement and Desorme's method – Reversible and Irreversible processes – Second law of thermodynamics – Carnot's Engine and Refrigerator – Carnot's Petrol and Diesel Engines – Efficiency. Entropy – Change in Entropy – Change in entropy in the reversible and irreversible process – T-S diagram – Entropy of a perfect gas – Third law of thermodynamics.

UNIT III THERMODYNAMIC RELATIONS

Thermodynamic relations – Maxwell's thermodynamic relations – Applications – joule – Thomson cooling – the coefficient for perfect and Van der Waals gas – Clausius – Clapeyron's Equation – Thermodynamic potentials – Internal energy – Helmholtz function – Gibbs function– Enthalpy – Relation of thermodynamic potentials with their

variables – T-S Equations – Maxwell's law of equipartition of energy-specific heats of mono atomic, diatomic gases – Clausius inequality – First and Second-order phase transition.

UNIT IV CONDUCTION AND RADIATION

Conduction and Radiation – Thermal Conductivity – definition – Coefficient of thermal conductivity –thermal conductivity of a bad conductor – Lee's disc method – a good conductor – Searle's method – radiation – Blackbody radiation –definition – Wien's Displacement law – Rayleigh Jean's law – Planck's law – Stefan's law and experimental verification of Stefan's law – Solar constant – temperature of the sun by Angstrom's Pyroeliometer.

UNIT V STATISTICAL PHYSICS

Statistical Physics – Phase Space – Volume in Phase space – Ensembles – Liouville's theorem – Microstate and Macrostate – Thermodynamic probability – Maxwell – Boltzmann distribution law – distribution function for an ideal gas – Mean, RMS and most probable speed – distribution of velocities – Limitations – Bose-Einstein distribution law – photon gas – Basic principles of Fermi-Dirac statistics – electron gas.

BOOKS FOR STUDY

1. Brijlal and Subrahmanyam, Heat and Thermodynamics, S.Chand& Co, 2002.
2. Brijlal, Subrahmanyam and Hemne, Heat thermodynamics and Statistical physics, S. Chand &Co, 2014.
3. Gupta and Kumar, Statistical Mechanics, Pragati Prakashan, 2003.
4. S.K.Roy, Thermal Physics and Statistical Mechanics, New Age International (P) Limited Publishers, New Delhi.

BOOKS FOR REFERENCE

1. D.S. Mathur, Heat and thermodynamics, S.Chand& Co., 2000.
2. S. Garg, R. Bansal and C. Ghosh, Thermal Physics, Tata McGraw-Hill, 1993.
3. S.S. Singhal, J.P. Agarwal, Sathyaprakash, Heat thermodynamics and statistical Physics, Pragati Prakashan, 2001.

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS IV - OPTICS AND SPECTROSCOPY

SEMESTER : IV **HOURS/WEEK : 5**

SUBJECT CODE : 21UPH04 **CREDITS : 5**

OBJECTIVES

- Understand the Geometry of lenses.
- Understand the Phenomena of optics.
- Attain adequate basic knowledge in spectroscopy.

LEARNING OUTCOMES

Students will gain thorough knowledge in the geometry of lenses, interference, diffraction and polarization. These perceptions will help to understand the spectroscopic techniques.

UNIT I GEOMETRICAL OPTICS

Geometrical Optics – Introduction (Convex lens – Optic Centre – Cardinal Points – Principal foci and principal points – An optic centre of a lens) spherical aberration in Lenses – methods of minimizing spherical aberration – Definition of coma, astigmatism and curvature of field, distortion – a chromatic aberration – dispersion by a prism – Cauchy's dispersion formula – dispersive power –Achromatism in prism – Deviation without dispersion – Chromatic aberrations in a lens – Circle of least confusion – Achromatic lens –Condition for achromatism of two thin lenses separated by a finite distance.

UNIT II INTERFERENCE

Interference – Coherence – temporal coherence and spatial coherence – Fresnel's biprism – Interference due to reflected and transmitted light – Airwedge - experiment to find the thickness of a wire – Testing the plainness of surfaces – Newton's rings – theory and experiment – Michelson's Interferometer and its applications (Determination of wavelength of monochromatic light – the difference in Wavelength between two neighbouring spectral lines and standardization of the metre)–Fabry-Perot Interferometer

UNIT III DIFFRACTION

Diffraction – Fresnel diffraction – Rectilinear propagation of light –zone plate – circular apertures – opaque circular disc – straight edge – Comparison of zone plate with convex lens – Fraunhofer diffraction pattern with N slits(diffraction grating) – normal incidence – absent and overlapping spectra of a diffraction grating.- Rayleigh's criterion – Resolving power of a telescope, prism, microscope and grating.

UNIT IV: POLARIZATION

Polarization – Brewster's law –Double refraction – Nicol prism as polarizer and analyzer –Huygen's theory of double refraction in uniaxial crystals – Double image polarizing prisms – Quarter wave plate, Half wave plate –Plane, elliptically and circularly polarized light – production and detection – Babinet's compensator –Dichroism – Polaroids - uses – Optical activity –Fresnel's explanation – Specific Rotation- Laurent's half shade polarimeter.

UNIT V: SPECTROSCOPY

Region of Electromagnetic Spectrum – Energy states of the atom – Wave and Particle properties of EMR – Interaction of low energy electromagnetic radiation with matter- the principle of laser- (Absorption, Transmission, Stimulated absorption, Spontaneous and Stimulated emission) optical pumping- Ruby and He- Ne laser - Applications – Holography –recording and reconstruction - IR spectroscopy – Basic principle, Instrumentation and applications – UV/Vis spectroscopy – Basic principle, Instrumentation and applications.

BOOKS FOR STUDY

1. Subrahmanyam and Brijlal, A textbook of OPTICS, S.Chand& Co., 2001
2. Aruldhas, Molecular structure and spectroscopy, 2 nd ed. EEE., 2007
3. Banwell C.N. &McCagh, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill Publishing Co. Ltd. 4th edition, 1994.
4. R. Murugeshan and Kiruthigasivaprasath, Optics and Spectroscopy, S.Chand&Co, 2010.

BOOKS FOR REFERENCE

1. Chang Raymond, Basic principles of spectroscopy, McGraw-Hill, 2003.
2. Ajoy Ghatak, Optics, The MC Graw Hill companies, 3rd edition, 2006.

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS PRACTICAL-II

SEMESTER	**: III & IV**	**HOURS**	**: 3/WEEK**
SUBJECT CODE	**: 21UPHP02**	**CREDITS**	**: 5**

OBJECTIVES

To understand and apply the principle of physics by doing related experiments in properties of matter, optics, electricity, electromagnetism and basic electronics.

LIST OF EXPERIMENTS (ANY FOURTEEN ONLY)

1. Young's modulus-Cantilever-Depression-scale and Telescope.
2. Torsion pendulum- Rigidity modulus of a wire (with and without mass).
3. Young's modulus-Non Uniform bending Koenig's method.
4. Frequency of tuning fork using Melde's apparatus.
5. Verification of Ohms law by Joule's calorimeter.
6. Specific heat capacity of a liquid by Newton's law of cooling.
7. Spectrometer-(i-d) curve - μ of the prism.
8. Spectrometer- Dispersive power of a prism and determination of the wavelength of mercury lamp by minimum deviation method.
9. Spectrometer- Grating-Minimum deviation method-determination of the wavelength of a mercury lamp.
10. Air wedge method-Thickness of thin wire and its insulation.
11. Refractive index of lens-Newton's rings method.
12. Potentiometer- comparison of Specific resistance of the given two coils
13. Carey Foster Bridge-temperature coefficient of the coil
14. M and B_H –Deflection magnetometer-TANA and TANB position.
15. Specific heat capacity of a liquid by Newton's law of cooling.
16. Comparison of EMF of two cells-B.G.
17. Bridge rectifier with regulator power supply (Zener diode).
18. Logic gates using discrete components - AND, OR, & NOT.
19. Verification of Demorgan's theorem using logic gates.
20. Verification of NAND & NOR Gates as Universal Building Block.

BOOKS FOR STUDY AND REFERENCE

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan Chand and sons educational publishers, New Delhi. Edition 2017
2. M.K Subramanian, S.Padmanathan, S.Somasundaram, B.Sc Allied Practical Physics, Apsara Publications, Trichy, Revised Edition 2020
3. C.C.Ourseph, C.Rangarajan, R. Balakrishnan – A Text Book of Practical Physics – S.Viswanathan Publisher – Part II (1996)
4. S.L. Gupta and V.Kumar – Practical Physics – PragatiPrakashan – 25th Edition (2002)

PEDAGOGY

Demonstration and practical Sessions

CORE PHYSICS V - ELECTRICITY AND MAGNETISM

SEMESTER : V **HOURS/WEEK : 5**

SUBJECT CODE : 21UPH05 **CREDITS 5**

OBJECTIVES

- To acquire in-depth knowledge of measuring instruments involving electric and magnetic fields.
- To study various magnetic properties of materials and their applications.
- To give an idea of the fundamentals of electromagnetic induction and alternating currents.

LEARNING OUTCOMES

On the successful completion of the course, students will be able to

- Recognize basic principles and applications of electrometers.
- Effectively formulate the electrical circuit problem into a mathematical problem using circuits, laws and theorems.

UNIT I CAPACITORS AND ELECTROMETERS

Spherical Capacitors - Cylindrical capacitors– Parallel plate capacitor – Effect of dielectric - the force of attraction between plates of a charged parallel plate capacitor – Guard Ring capacitor – Mica capacitor – uses of capacitors - Quadrant electrometer – measurement of potential, ionization current and dielectric constant.

UNIT II ELECTRICAL MEASUREMENTS AND THERMOELECTRICITY

Carey–Foster Bridge – theory – temperature coefficient of resistance –potentiometer – calibration of ammeter and high range voltmeter –thermoelectricity – laws of thermo e.m.f.– measurement of thermo e.m.f. using potentiometer–Peltier effect and Peltier coefficient – Thomson effect and Thomson coefficient – relation between π and σ – thermoelectric diagrams and their uses.

UNIT III MAGNETIC PROPERTIES OF MATERIALS

Relation between three magnetic vectors B, H and M- Intensity of magnetization - Susceptibility – Permeability – Properties, Electron theory and Langevin's theory of dia, para and ferromagnetic materials - magnetic hysteresis – Experiment to draw B-H curve – Ballistic method – Energy loss - determination of susceptibility: Gouy's method.

UNIT IV ELECTROMAGNETIC INDUCTION

Magnetic induction due to a straight conductor carrying current – Moving coil ballistic galvanometer – damping correction –absolute capacity of a condenser using B.G – Ampere's circuital Law- Faradays Laws of electromagnetic induction – vector form - self – inductance by Anderson's Bridge method – Mutual inductance – Experimental determination - coefficient of coupling.

UNIT V ALTERNATING CURRENT

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

BOOKS FOR STUDY

1. Brij Lal and Subrahmanyam, *Electricity and Magnetism*, S. Chand & Co, New Delhi (2016)
2. R. Murugesan, *Electricity and Magnetism*, S. Chand & Co, New Delhi(2016)

BOOKS FOR REFERENCE

1. D. N. Vasudeva, *Electricity and Magnetism*, S. Chand & Co, New Delhi(2016)
2. K. K. Tewari, *Electricity and Magnetism*, S. Chand & Co, New Delhi (2016)
3. *Fundamentals of Electricity and Magnetism* – B.D.Duggal and C.L. Chhabra, Vishal Publishing Co(2004)

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS VI - SOLID STATE PHYSICS

SEMESTER : V **HOURS/ WEEK : 5**

SUBJECT CODE : 21UPH06 **CREDITS : 5**

OBJECTIVES

- To learn crystal structures
- To study diffraction of X-rays by crystal and defects in crystals
- To know the basics of magnetism and superconductivity
- To understand the electric and dielectric properties of non-metals
- To gain the knowledge of thermal and electrical properties of solids.

LEARNING OUTCOMES

This course facilitates the student to understand the macroscopic properties of solids in terms of microscopic particles (components) of the solid.

UNIT I CRYSTAL STRUCTURE

Crystal Lattice - Primitive and Unit cell – Crystal systems - Bravais Lattice - Miller Indices – Crystal structures - Simple cubic, body-centred Cubic, Face Centered Cubic, Hexagonal close-packed structure - Perovskite and spinel structure - Sodium Chloride, Zinc Blende and, Diamond Structure.

UNIT II CRYSTALLOGRAPHY AND CRYSTAL IMPERFECTIONS

Diffraction of X-Rays by Crystals - Bragg's Law in one Dimension - Experimental Method in X-Ray Diffraction - Laue Method, Rotating Crystal Method - Powder Photograph Method - Symmetry Operations - Classification of defects - Point Defects, Line Defects - Surface Defects - Volume Defects - effects of Crystal Imperfections.

UNIT III MAGNETISM AND SUPERCONDUCTIVITY

Classification of Magnetic materials - Classical Theory of Diamagnetism (Langevin's Theory) –Classical Theory of Paramagnetism (Langevin's Theory) - Weiss Theory of Paramagnetism - Heisenberg's theory and Quantum Theory of Ferromagnetism – Antiferromagnetism – Ferrites - General properties of superconductors – Types of superconductors – Meissner effect - Applications of superconductors.

UNIT IV DIELECTRICS

Fundamental Definitions in Dielectrics - Different types of Electric polarization - Frequency and Temperature Effects on Polarization - Dielectric Loss - Local Field on Internal Field Clausius-Mosotti Relation - Determination of Dielectric Constant - Dielectric Breakdown - Properties of Different Types of Insulating Materials.

UNIT V THERMAL AND ELECTRICAL PROPERTIES OF SOLIDS

Introduction – specific heat of solids – classical theory (Dulong and Petit law) -Einstein's theory of specific heat – Debye's theory of specific heat – Debye's approximation – Free Electron Theory of metals – Electron Drift, mobility, mean free path – relaxation ions – Electrical and Thermal conductivities of metals – Wiedmann Franz law – Fermi energy.

BOOKS FOR STUDY

1. C. Kittel Introduction to Solidstate Physics, Wiley India Edition, 2019, 8thEdn.
2. M. Arumugam, Materials Science, Anuradha Publishers, 2004.
3. S.O. Pillai, Solid State Physics, New Age International (P) Ltd, 2018.
4. M.A. Omar, Elementary Solid State Physics, Pearson Education, 2011.
5. R. Murugeshan and Kiruthiga Sivaprasath, S. Chand and Co. limited 2010

BOOKS FOR REFERENCE

1 V. Raghavan, Material Science and Engineering, PHI. Ed., 2004.

2 L.V. Azaroff, Introduction to Solids, TMH. 2009.

3 A J Dekker, Solid State Physics, Macmillan Publishers India Ltd., 2000.

4 R. Arumugam, Modern Physics.

WEBSITES FOR REFERENCE

https://en.wikipedia.org/wiki/Crystal_structure

https://en.wikipedia.org/wiki/Crystallographic_defect

https://en.wikipedia.org/wiki/Dielectric

https://nptel.ac.in/content/storage2/courses/115101005/downloads/lectures-doc/Lecture-21.pdf

Pedagogy

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS VII

ANALOG AND DIGITAL ELECTRONICS

SEMESTER : V **HOURS/WEEK : 5**

COURSE CODE : 21UPH07 **CREDITS 5**

OBJECTIVES

- Providing an overview of the principles, operation and applications of special diodes.
- Introducing transistor and transistor biasing.
- Providing an overview of the principles, operation and applications of special devices.
- Providing an overview of amplifiers, oscillators and their applications in different electronic fields.
- To make students acquire knowledge about Boolean algebra, logic circuits, designing counters and the basic concepts of memory and programmable logic device.

LEARNING OUTCOMES

Upon completion of the course, the students will be able to

- Understand the implications of characteristics of special diodes.
- Understand the implications of characteristics of Transistors.
- Gain knowledge on FET, MOSFET, UJT and SCR.
- Know the operating characteristics of a transistor amplifier.
- Gain an understanding of multivibrators, operational amplifiers and their applications.

UNIT I SPECIAL DIODES AND TRANSISTORS

Spectral response of human eye - Light Emitting Diode (LED)– advantages and its applications – photo transistor -- characteristics and applications – Tunnel diode and its characteristics – Tunnel diode as an Oscillator – Varactor diode– Schottky diode –Theory and its applications – Transistor – modes of operations – H parameters of an ideal CE configuration – need for biasing transistor – base resistor, feedback resistor, voltage divided bias methods.

UNIT II SPECIAL DEVICES AND OPERATIONAL AMPLIFIERS

JFET construction - biasing - JFET characteristics – parameters - Common source JFET amplifier UJT: construction - working – equivalent circuit - characteristics – Relaxation oscillator – SCR: Construction – working – equivalent circuit - V-I characteristics and their application. Op-amp characteristics – Inverting and non-inverting amplifier - CMRR –

Applications: Sign changer and scale changer – adder – subtractor – integrator – differentiator.

UNIT III AMPLIFIERS & OSCILLATORS

Amplifiers: Principle of negative feedback – performance analysis of single-stage transistor amplifiers –Frequency response -- RC coupled two-stage transistor amplifier – decibel gain - - Heat sinks - transformer coupled class A power amplifier. **Oscillators:** Positive feedback amplifier as an oscillator – Colpitt's oscillator - Hartley oscillator. Principle of multivibrator - Astable – monostable – bistable multivibrator using transistors – Applications.

UNIT IV NUMBER SYSTEM, ARITHMETIC AND LOGICAL CIRCUITS

Number systems – Binary – Octal – Hexadecimal and its conversions – Binary Codes – BCD codes-8421 code – Excess 3 code – Gray code – Boolean algebra – reducing Boolean expressions – Karnaugh maps simplification (SOP) - Half adder – full adder – half subtractor – full subtractor– encoder-decoder - Flip flop – RS Flip Flop, D and T Flip Flop – JK Flip Flop.

UNIT V REGISTERS, COUNTERS AND CONVERTORS

Registers – Shift registers – Shift left and Shift right registers – Synchronous - Asynchronous/Ripple counters – modulus counter – Mod Counters – Decade counter - Digital to Analog (D/A) converter – R/2R Ladder Network – Analog to Digital (A/D) Converter - counter type – successive approximation A/D Converter.

BOOKS FOR STUDY

1. Mehta V. K. Principles of Electronics, New Delhi, S. Chand & Co. Ltd., 2003.
2. Atul P. Godse, Deepali A. Godse, Electronic Circuits, Pune, Technical Publications, 2009.
3. B. L. Theraja, Basic electronics, S. Chand, New Delhi, 2010.
4. D Leach, Albert Malvino, Digital Principles and Applications, CMc-grawHill Inc., US (1994)

BOOKS FOR REFERENCE

1. Millman J. and Halkias C., Integrated Electronics, New Delhi, Tata McGraw Hill, 2001.
2. Thomas L. Floyd, Electronic Devices, New Delhi, Kindersley (India) Pvt. Ltd., 2003.
3. Charles A. Schuler, Roger L. Tokheim, Electronic Principles and Applications, New Delhi, Tata McGraw Hill Publishing Company Limited, 2008.
4. Arul Thalapathy M., Basic and Applied Electronics, Chennai, Comtek publisher, 2005.

5. Palanisamy P. K., Ramesh Babu P., Ganesh Babu T. R., Electronic Devices and Circuits, Chennai, Scitech Publications (India) Pvt. Ltd., 2005.
6. Allen Mottershead, Electronic Devices and Circuits, New Delhi, Prentice-Hall of India, 1996.
7. Arun P., Electronics, New Delhi, Narosa Publishing House, 2008.
8. Basavaraj B., A Text Book of Basic Electronics, Mumbai, Himalaya Publishing House, 2007.
9. Chatterji B.N, Digital Computer technology, Khanna Publishers, Delhi, 2nd edition 1986.
10. Puri V.K, Digital Electronics circuits and systems, Tata McGraw Hill Publishing Company Limited New Delhi, 1st edition 1997.
11. S. Salivahanan, S. Arivazhagan, Digital Circuits and Design, Vikas Publishing House Private Limited, 3rd edition 2007.

WEBSITES FOR REFERENCE

1. www.elprocus.com/working-theory-of-an-rc-coupled-amplifier/
2. www.circuitstoday.com/transistor-amplifier
3. www.visionics.a.se/html/.../RC%20Coupled%20Amplifier1.html
4. www.circuitstoday.com/ujt-uni-junction-transistors
5. http://www.electronics-tutorials.ws/power/unijunction-transistor.html
6. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-5/junction-field-effect-transistors-jfet/
7. http://www.futureelectronics.com/en/transistors/jfet-transistor.aspx
8. http://www.electronics-tutorials.ws/transistor/tran_6.html
9. www.learnabout-electronics.org/Oscillators/osc10.php
10. https://www.youtube.com/watch?v=A-gWV5liKxM
11. https://www.youtu.be/gl-qXk7XojA
12. https://www.youtu.be/qXv08d8caYc
13. E-module: https://www.youtu.be/fKVZpuptPo

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS VIII – ATOMIC PHYSICS

Semester : VI **Hours/week : 5**

Course Code : 21UPH08 **Credits 5**

OBJECTIVES

- To provide a coherent and concise coverage of the important atomic concept of physics
- To provide the knowledge of positive rays and the photoelectric effect.
- To provide the basic concepts of the Quantum Vector atom model and Spectral lines analysis.

LEARNING OUTCOMES

- Acquire knowledge of the fundamentals of atomic physics.
- Understand the concepts and potential of atomic physics.
- Analyses the atomic spectra.

UNIT I POSITIVE RAYS

The deflection of charged particles in electric and magnetic fields – Positive ray analysis – Thomson's parabola method – theory – determination of e/m and mass of positive ions – mass spectrograph method - Aston's mass spectrograph - determination of masses of isotopes – uses of mass spectrographs - separation of isotopes– diffusion method – thermal diffusion method – pressure diffusion method.

UNIT II PHOTOELECTRIC EFFECT

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

UNIT III ALPHA SCATTERING

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

UNIT IV VECTOR ATOM MODEL

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

UNIT V ATOMIC SPECTRA

X-ray spectra – continuous and characteristic spectra – Moseley's law(Statement, Explanation and Importance) – Compton effect – Expression for change of wavelength – Spectral terms and notations – the fine structure of Sodium D lines – the fine structure of Hα line – Zeeman effect – Larmor's theorem – Quantum mechanical explanation of normal Zeeman effect – anomalous Zeeman effect of D1 and D2 lines of Sodium – Paschen – Bach effect – Stark effect.

BOOKS FOR STUDY

1. Arthur Beiser, Concepts of Modern Physics (5^{th} edition)
2. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co., New Delhi (2016)
3. J.B.Rajam, Atomic physics, S. Chand & Co., (2004)
4. N.Subrahmanyam, Brij Lal and JivanSeshan, Atomic and Nuclear Physics, S. Chand & Co., New Delhi (2013)

BOOKS FOR REFERENCE

1. Hugh D. Young and Roger A.Freedman, Sears & Zemansky's University Physics with Modern Physics, 14^{th} Edition (2015)
2. Max Born, Atomic physics, Dover Publications Inc, 8 edition, (1990)
3. Samuel Glasstone, A Sourcebook on Atomic energy, Krieger Publishing Company; 3^{rd} Revised edition (2014)
4. Henry Semat, John R. Albright, Introduction to Atomic and Nuclear Physics, Fletcher & Son Ltd, Norwich;(1972)
5. Feynmann Lectures, Vol II and III
6. Halliday/Resnik/Krane, Physics – Vol II, 6^{th} edition extended.

WEBSITES FOR REFERENCE

http://acept.la.asu.edu/PiN/rdg/photoelectric/photoelectic.shtml

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/vecmod.html

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/zeeman.html

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS IX - NUCLEAR PHYSICS

SEMESTER : VI **HOURS/WEEK : 5**

COURSE CODE : 21UPH09 **CREDITS 5**

OBJECTIVES

- To understand the fundamentals of the formation of a nucleus, composition of a nucleus with their energy.
- To enable the students to acquire knowledge of nuclear energy, fission and fusion with a particle accelerator.

LEARNING OUTCOMES

- Acquire knowledge and apply it.
- Acquire knowledge of the structure of the nucleus.
- understand the formation of the nucleus and its binding energy
- students can analyse the energy released by the nucleus during the fission and fusion process.

UNIT I NUCLEAR STRUCTURE

General properties of the nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipole moment) – Experimental measurement of nuclear radius – mirror nuclei method- Binding energy – BE/A and stability of nucleus – Packing fraction – Nuclear forces (Definition, Properties, Meson theory)– Models of nuclear structure – Liquid drop model – Semi-empirical mass formula – Shell model –Collective model.

UNIT II DETECTOR AND PARTICLE ACCELERATORS

Interaction between the energetic particles and matter – Heavy charged particles – Electrons – Gamma ray-Ionization chamber – Solid State detector – GM counter – Wilson Cloud chamber – Bubble Chamber - Nuclear emulsion – Linear accelerators – Synchrotron – Synchrocyclotron - Proton Synchrotron – Betatron.

UNIT III RADIOACTIVITY

Natural Radioactivity - Velocity and range of alpha particles – Alpha, Beta and Gamma rays – Properties – Determination of Charge of Alpha particle – Fermi's theory of Beta decay – Origin of gamma rays - Determination of Wavelength of Gamma rays - Laws of radioactivity – Soddy-Fajan’s displacement law – Law of radioactive disintegration – Half-life period – Mean life period – Decay constant - Artificial radioactivity – Preparation of radioelements – Application of radioisotopes.

UNIT IV NUCLEAR FISSION AND FUSION REACTIONS

Nuclear fission – energy released in fission – Bohr and Wheeler's theory of nuclear fission – Chain reaction – Multiplication factor – Critical size and critical mass –Energy balance and Q value – Natural Uranium and chain reactions – Atom Bomb – Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – The hydrogen bomb – Controlled thermonuclear reactions – Transuranic elements.

UNIT V COSMIC RAYS AND ELEMENTARY PARTICLES

Cosmic rays – Origin of cosmic rays – Latitude effect – Azimuth effect – Altitude effect – Seasonal, Diagonal changes – Primary and Secondary Cosmic rays cascade theory of shower –Pair production and Annihilation– Elementary particles – Classification of elementary particles– particles and antiparticles – Antimatter – Fundamental interactions – Quark model.

BOOKS FOR STUDY

1. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co., New Delhi (2016)
2. N. Subramaniyam, Brij Lal and JivanSeshan, Atomic and Nuclear Physics, S. Chand & Co., New Delhi,(2013)
3. M.L. Pandya and R.P.S. Yadav, Elements of Nuclear Physics, KNRN Publication,(2015)
4. D.C.Tayal, Nuclear Physics, Himalaya Publishing House (2011)
5. B.N. Srivatsava, Basic Nuclear Physics and Cosmic rays, PragtiPrakashan publishers, Meerut (2011)

BOOKS FOR REFERENCE

1. T.A. Littlefield, N. Thorley, Atomic and Nuclear Physics, Medtec, New Delhi (2013)
2. Max Born, Atomic physics, Dover Publications Inc, 8 edition, (1990)
3. Samuel Glasstone, A Sourcebook on Atomic energy, Krieger Publishing Company; 3rd Revised edition(2014)
3. Henry Semat, John R. Albright, Introduction to Atomic and Nuclear Physics, Fletcher & Son Ltd, Norwich; (1972)
4. Hugh D. Young and Roger A. Freedman, Sears &Zemansky's University Physics with Modern Physics,14th Edition (2015).
5. Bernard L. Cohen, Concepts of Nuclear Physics, McGraw–Hill Inc., US (1971)

WEBSITES FOR REFERENCE

1. www.pnp.physics.ox.ac.uk/nuclear physics
2. www.ocw.mit.edu.physics
3. www.aovgun.weebly.com/nuclear physics and radioactivity

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS – X QUANTUM MECHANICSAND RELATIVITY

SEMESTER : VI **HOURS/WEEK : 5**

COURSE CODE : 21UPH10 **CREDITS : 5**

OBJECTIVES

- To make the students understand the basic concepts of Quantum Mechanics and Fundamental Postulates of Relativity.
- To expose the students to the applications of Quantum Mechanics and Relativity.

LEARNING OUTCOMES

- Understand the basics concepts of quantum particles.
- Apply the basic to construct and solve the particle equations in one dimension and three-dimension form.
- Acquire knowledge of Relativity theory and its application in day to day life.

UNIT I DUAL NATURE OF MATTER

Dual Nature of matter - De Broglie concept of matter waves – De Broglie wavelength – Wave velocity - Expression for Group velocity -Relation between Wave velocity and group velocity – Experimental study of matter waves – Davison and Germer's experiment – G.P. Thomson's experiment.

UNIT II WAVE MECHANICS

Heisenberg's Uncertainty Principle – Illustration – Diffraction of electrons through a slit – Gamma-ray microscope – Application – Non-existence of free electrons in the nucleus – Basic postulates of wave mechanics – Eigenvalue and Eigenfunction – operator formalism – linear operators – Properties of Linear operators –Inverse operators – Expectation values (Position and momentum).

UNIT III SCHRÖDINGER'S WAVE EQUATION IN ONE DIMENSION

Schrödinger's wave equation for time-dependent and time-independent forms – Schrodinger's equation for free particle – physical significance and properties of wave function – Normalized and orthogonal wave function – Particle in a box – Tunneling effect – Barrier penetration problem – Linear harmonic oscillator – zero-point energy.

UNIT IV SCHRÖDINGER'S WAVE EQUATION IN THREE DIMENSION

Three dimensional Schrödinger's wave equation – Hydrogen atom – Wave equation for the Motion of an electron – Separation of variables – Azimuthal wave equation and its solution

– Radial wave equation and its solutions – Polar wave equation and its solution – Rigid rotator – Separation of variables – Rotational energy levels and Eigen functions.

UNIT V RELATIVITY

The frame of reference – Galilean transformation – Michelson and Morley experiment – postulates of the special theory of relativity – Lorentz transformation – relativity of simultaneity – addition of velocities - a variation of mass with velocity – Mass – energy relation – Minkowski's four-dimensional space-time continuum – four-vectors.

BOOKS FOR STUDY

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern physics*, S. Chand & Co., New Delhi (2016)
2. SathyaPrakash, Advanced Quantum Mechanics, Kedar Nath Ram Nath, Meerut (2012)
3. Ajoy Ghatak, S. Loganathan, Quantum Mechanics, Springer 2004

BOOKS FOR REFERENCE

1. V.K. Thangappan, *Quantum mechanics*, New Age International, (1993)
2. P.M. Mathews and K. Venkatesan, *A Textbook of Quantum Mechanics*, Tata McGraw–Hill, New Delhi (1976)
3. G. Aruldass, *Quantum Mechanics*, Prentice–Hall of India Pvt. Limited,(2002)
4. Leonard I. Schiff, Quantum Mechanics, Tata McGraw.HILL Third edition 2010.
5 A. Beiser, Concepts of Modern Physics, McGRAW HILL Sixth edition 2009.

WEBSITES FOR REFERENCE

http://hyperphysics.phy.astr.gsu.edu

http://physicstoday.scitation.org

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

CORE PHYSICS PRACTICAL - III

SEMESTER : V & VI **HOURS/WEEK : 3**

SUBJECT CODE: 21UPHP03 **CREDITS : 5**

OBJECTIVES

To understand and apply the principle of physics by doing related experiments in properties of Matter, Optics, Electricity and electromagnetism

LIST OF EXPERIMENTS (ANY FOURTEEN ONLY)

1. Koenig's method-Uniform bending-determination of Young's Modulus
2. Bifilar pendulum - parallel threads.
3. Young's Modulus – Cantilever - By dynamic method.
4. Viscosity - ungraduated burette and radius by mercury pellet method.
5. Spectrometer – i-i' curve-Refractive index.
6. Spectrometer -small angled prism - Refractive index.
7. Spectrometer - Cauchy's constant.
8. Refractive index of a liquid – by Newton's Rings method.
9. Wavelength of light using Biprism.
10. Potentiometer - High range voltmeter calibration.
11. Potentiometer - EMF of a thermocouple.
12. Absolute capacity of a Capacitor - Ballistic Galvanometer (B.G).
13. Comparison of mutual Inductance using B.G
14. Absolute determination of mutual Inductance - Ballistic Galvanometer.
15. Field along the axis of a coil - Vibration Magnetometer.
16. Hysteresis curve - deflection magnetometer.
17. Parallel resonance circuit.
18. Series resonance circuit.
19. Construction of regulated IC power supply and analyzing the fault in the power supply.
20. Conversion of the Galvanometer into ammeter and voltmeter.

BOOKS FOR STUDY AND REFERENCE

1. M.N.Srinivasan, S Balasubramanian, R Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan Chand and sons educational publishers, New Delhi. Edition 2017
2. M.K Subramanian, S.Padmanathan, S.Somasundaram, B.Sc Physics Practical, Apsara Publications, Trichy, Revised edition 2020
3. C.C.Ourseph, C.Rangarajan, R. Balakrishnan – A Text Book of Practical Physics – S.Viswanathan Publisher – Part II (1996)
4. S.L. Gupta and V.Kumar – Practical Physics – PragatiPrakashan – 25th Edition (2002)

PEDAGOGY: Demonstration and practical sessions.

CORE PHYSICS PRACTICAL – IV

SEMESTER : VI **HOURS/WEEK : 3**

SUBJECT CODE : 21UPHP04 **CREDIT : 5**

OBJECTIVES

To understand the basic role of various components in an electronic circuit, to build the circuits such as amplifiers, oscillators, digital circuits and to do the simple programs in 8085 microprocessor.

LIST OF EXPERIMENTS (ANY FOURTEEN ONLY)

1. Half adder and half subtractor using NAND gates.
2. FET characteristics.
3. UJT characteristics
4. Characteristics – Light Dependent Resistor (LDR).
5. OP-AMP – Inverting and Non-Inverting amplifier.
6. OP-AMP - Adder and Subtractor.
7. OP-AMP - Differentiator and Integrator.
8. Hartley Oscillator using transistor.
9. Colpitt's Oscillator using transistor.
10. RS, D, T and JK Flip flops-truth table verification – using NAND gates.
11. RC coupled amplifier- single stage.
12. Astable multivibrator using a 555 timer.
13. Mono stable multivibrator using 555 timers.
14. Solving simple Boolean equation using IC's. (NAND – NAND logic)
15. To make a Shift Register (serial-in and serial-out & parallel in and parallel out) using D / JK -type Flip-Flop ICs.
16. Construction of dual power supply and analyzing the fault in regulated power supply.
17. To build a 3-bit serial & parallel counter using D / JK-type Flip-Flop ICs.
18. Seven Segment Display using IC 7447.
19. Microprocessor 8085 – 8 Bit addition and multiplication.
20. Microprocessor 8085 – 8 Bit subtraction and division.

BOOKS FOR STUDY AND REFERENCE

1. Advanced Physics Experiments, Department of physics, St.Joseph college, Trichy First Edition (May 2005).
2. Practical physics, R K Shukla, New Age International Publisher, 2007.
3. 2. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan Chand and sons educational publishers, New Delhi. Edition 2017.
4. M.K Subramanian, S.Padmanathan, S.Somasundaram, B.Sc. Physics Practical, Apsara Publications, Trichy, Revised edition 2020.
5. C.C. Ourseph, C. Rangarajan, R. Balakrishnan – A Text Book of Practical Physics – S. Viswanathan Publisher – Part II (1996)

PEDAGOGY: Demonstration and practical sessions.

ELECTIVE – I - MATERIALS SCIENCE

SEMESTER : V **HOURS/ WEEK : 5**

SUBJECT CODE : 21UPHE01 **CREDITS 4**

OBJECTIVES

The course completely gives basic ideas about various types of materials and their physical and chemical properties. Also, it deals with the testing methods to know their properties for suitable applications.

LEARNING OUTCOMES

On the successful completion of the course, students will be able to

- Understand the mechanical properties of materials
- Familiar with the optical properties.
- Understand the basics of Nonlinear optics
- Explore the knowledge in modern engineering materials

UNIT I MECHANICAL BEHAVIOUR OF MATERIALS

Different mechanical properties of engineering materials – creep- factors influencing creep resistance – theories of creep- fracture- mechanism of brittle fracture- ductile fracture – mechanism of ductile fracture - the difference between brittle and ductile fracture- mechanism of creep fracture – factors affecting mechanical properties of materials.

UNIT II OPTICAL PROPERTIES OF MATERIALS

Fundamental terms- absorption- emission- Dispersion- Beer’s law and Lambert's law- electronic transitions - trap s- excitons - colour centres fluorescence, photoluminescence, phosphorescence principles – applications – photoconductivity - photoconductor bias circuit – performance – applications.

UNIT III NONLINEAR OPTICAL AND NANOPHASE MATERIALS

Origin of optical nonlinearity - Basic theory of nonlinear optics – Harmonic generation- Optical mixing- classification of nonlinear optical materials and their applications. Nano phase Material - Top-down & Bottom-up approach - synthesis- Ball milling method and Sol-Gel method physical properties with geometry –applications.

UNIT IV BIOMATERIALS

Biomaterials-Definition- the need for biomaterials- general properties- biocompatibility- biomaterial sources- advantages and disadvantages- Metallic biomaterials-ceramic and glass biomaterials-polymeric biomaterials – examples - applications.

UNIT V ENGINEERING MATERIALS

Introduction- metallic glasses – ceramics - Super strong materials - Cermets – High-temperature materials – Thermoelectric materials – Electrets – Nuclear engineering materials – fibre optic materials – properties and applications.

BOOKS FOR STUDY

1. Materials Science and Engineering V.Raghavan, Prentice Hall India Ed. V 2004. New Delhi
2. Materials Science by M.Arumugam, Anuradha Publishers. 1990, Kumbakonam
3. P K Palanisamy, Material science, .Scitech Publications, 2015
4. B.B.Laud, Lasers and Nonlinear Optics, New Age International Ltd.., NewDelhi. 2004
5. Vasif Hasirci and Nesrin Hasirci, Fundamentals of Biomaterials, Springer 2008

BOOKS FOR REFERENCE

1. Kittel C., Introduction to Solid State Physics, V11 Ed, Wiley Eastern
2. Manchanda VK., A textbook of Materials Science, New India Publishing House, 1992
3. Banwell C.N. &McCagh, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill Publishing Co. Ltd. 4th edition, 1994.

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

ELECTIVE - I

ASTROPHYSICS

SEMESTER : V **HOURS/ WEEK 5**

SUBJECT CODE : 21UPHEO2 **CREDITS 4**

OBJECTIVES

- This paper presents the fundamentals of the Astronomy and Astrophysics
- To enable the students to acquire knowledge of the Solar system, Stars and Galaxies

LEARNING OUTCOMES

To acquire knowledge and apply it

- to study the structure of the Sun and Earth
- to know the origin of the Universe and its models
- to motivate the students to analyse the mystery of the Universe.

UNIT I PLANETS AND THEIR SATELLITES

Surface features, internal structure, atmospheres and magnetic fields of Earth- Phases and their features of Moon- Revolution of the Planets- Planets and their satellites and rings.- Space probes to Mars and Moon - Origin of the solar system.

UNIT II ASTEROIDS, METEORS AND COMETS

Discovery of minor planets (Asteroids), their orbits and physical nature - Meteors and meteorites - Observation of meteor showers- Meteorites, its types and composition -Meteorite craters. Discovery and designation of Comets - Nature of dust particles and origin of comets- Periodic comets and their physical nature.

UNIT III SUN

Surface features of the sun - Internal structure of the sun - photosphere, chromosphere and corona - Sunspots and magnetic fields on the sun- Solar activity - solar prominences, solar flares, solar wind and solar-terrestrial relationship.

UNIT IV STARS AND GALAXIES

Energy generation in stars - Basics of Star formation - Evolution of stars of different masses-. Chandrasekhar limit- Super dense objects: White dwarfs, Neutron stars and Pulsars. -Black holes.- Classification of galaxies-Spiral galaxies, Elliptical galaxies and Irregular galaxies– Features of Milkyway galaxy.

UNIT V ORIGIN OF UNIVERSE

The expansion of the Universe-Hubble's law- redshift - Evidence for the evolution of the universe - Cosmological models: Big Bang theory and Steady-State theory – Nature of space-time – Discovery of Gravitational waves - Dark matter.

BOOKS FOR STUDY

1. Mohit Kumar Sharma and Suresh Chanandra, A text of Astronomy and Astrophysics, IK International publishing house, New Delhi(2019)
2. BaidyanathBasu, SudhindraNathBiswas and TanukaChattopadhyay, An Introduction to Astrophysics, Prentice Hall India Learning Ltd, New Delhi (2010)

BOOKS FOR REFERENCE

1. K.D. Abyankar, Astrophysics of the solar system, University press, India (1999)
2. P. Devadas, The fascinating Astronomy, Devadas Telescopies, Chennai,
3. R.P. Singhal, Elements of Space Physics, Prentice Hall India Learning Ltd, New Delhi, (2009)

WEBSITES FOR REFERENCE

1. www.space.com
2. www.astronomynow.com
3. www.skyandtelescope.com
4. www.nasa.gov

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

ELECTIVE – II ENERGY PHYSICS

SEMESTER : VI **HOURS/ WEEK : 5**

SUBJECT CODE : 21UPHE03 **CREDITS : 4**

OBJECTIVES

To know about the conventional and non-conventional energy sources

To know about solar energy in detail and its applications

To gain knowledge on wind energy

To have an understanding of the biomass energy

To understand the various modes of energy storage

LEARNING OUTCOMES

This course enables the student to understand the significance of renewable energy sources.

UNIT I INTRODUCTION TO ENERGY SOURCES

Energy consumption as a measure of prosperity – World Energy Future – Energy Sources and their availability – conventional energy sources – Non-conventional and Renewable energy sources – comparison – merits and demerits.

UNIT II SOLAR ENERGY

Solar energy Introduction – Solar constant – Solar radiation at the Earth's surface – Solar radiation geometry – Solar radiation measurements – Solar radiation data - Solar energy storage and storage systems – Solar pond – solar cooker – solar water heater - solar greenhouse – Types of greenhouses – Solar cells.

UNIT III WIND ENERGY

Introduction – The nature of the wind – Basic principle of wind energy conversion – wind energy data and energy estimation - basic components of Wind Energy Conversion Systems (WECS) – Advantages and disadvantages of WECS – Applications – energy from tides.

UNIT IV BIOMASS ENERGY

Introduction – Classification – Biomass conversion technologies - Photosynthesis – fermentation - Biogas generation –classification of biogas plants - anaerobic digestion for biogas – wood gasification – advantages & disadvantages.

UNIT V ENERGY STORAGE

Importance of energy storage- batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.

BOOKS FOR STUDY

1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4thEdn.
2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rdEdn.
3. D P Kothari, K P Singal, Rakesh Rajan, PHI Learning Pvt Ltd, 2011, 2ndEdn.

BOOKS FOR REFERENCES

1. John Twidell& Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2nd Edn.
2. S.A. Abbasi and NasemaAbbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.
3. M. P. Agarwal, Solar Energy, S. Chand & Co. Ltd., New Delhi,1982
4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

WEBSITES FOR REFERENCE

1) http://www.energy.gov module 4: Fuel cell technology
2) http://www.fuelcelltoday.com Fuel cell basics

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

ELECTIVE – II ELECTRONIC COMMUNICATION SYSTEMS

SEMESTER : VI **HOURS/ WEEK : 5**

SUBJECT CODE : 21UPHE04 **CREDITS 4**

OBJECTIVE

- To enable the students to understand the different types of communications and make them appreciate the flavour of physics in communication.

LEARNING OUTCOMES

- Students will be able to distinguish different sources and its principle of operation in the field of communication.
- Students will able to demonstrate the different elements of the communication systems

UNIT-I: FUNDAMENTALS OF ELECTRONIC COMMUNICATION

Line communication - Wireless communication - Types of electronic communication Simplex-Half duplex - Full duplex - Transmitter – Channel - Receiver – Bandwidth – Noise - Signal - Analog and digital signal Decibel - Signal-to-noise ratio - Electromagnetic spectrum - Extremely low frequencies - Voice - Very low - Ultra-high - Super high frequencies - Radio waves - Wave propagation - Ground waves - Space waves - Ionosphere layers - Skywaves - Critical frequency and critical angle - Multiple hop transmission.

UNIT-II ANALOG COMMUNICATIONS

Modulation-amplitude modulation and demodulation, phase modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem.

UNIT –III DIGITAL COMMUNICATIONS

Need for digital transmission - Pulse Code Modulation, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation.

UNIT – IV: FIBER OPTIC AND RADAR COMMUNICATION

Optical fibre-classifications- numerical aperture- fibre optic communication system-Applications -Elements of a Radar System-Radar equation-Radar Performance Factors-Radar Transmitting Systems-Radar Antennas-Duplexers-Radar Receivers and Indicators- -Other Radar Systems.

UNIT – V: MICROWAVE AND SATELLITE COMMUNICATION

Microwaves-Wave guides-Types of wave guides-Traveling wave tubes-Microwave antennas-Horn antenna-Parabolic antenna. Satellites-Natural and Artificial satellites-Types of active satellites-Passive satellites- Orbit fundamentals-Circular orbits-Elliptical orbits-Equatorial orbits-Polar orbits- Principles of satellite communication-Subsystems of a communication satellite-Advantages of satellite communication-Applications of satellite communication.

Self-Study: Telephony and Basic concept of mobile communication, frequency bands used in mobile communication, SIM number, IMEI number, need for data encryption, the idea of GSM, CDMA, TDMA and FDMA technologies, 2G, 3G and 4G concepts.

BOOKS FOR STUDY

1. Louis E. Frenzel, Communication Electronics Principles and Applications, New Delhi, Tata McGraw Hill Publishing Company Ltd., 2002.
2. Wayne Tomasi, Electronic communication systems, New Delhi, Pearson publications, 2011.
3. William Schwab, Electronic communication systems A complete course, New Delhi, Prentice-Hall of India Pvt. Ltd., 2002.

BOOKS FOR REFERENCE

1. Dennis Roddy, John Coolen, Electronic communication, New Delhi, Prentice-Hall of India Pvt. Ltd., 2002.
2. Roy Blake, Wireless communication Technology, Bangalore, Eastern Press Pvt.Ltd., 2001.
3. M. Mukundarao, Optical communication, Hyderabad, Universities Pres Ltd., 2000.
4. Dennis Roddy, Satellite communications, New Delhi, McGraw Hill Publishing International edition, 2001.
5. Maroon cole, Introduction to Telecommunication: Voice, data and Internet, New Delhi, New Age Publishers, 2002.

WEBSITES FOR REFERENCE

1. https://www.electronicshub.org/wireless-communication-introduction-types-applications/
2. https://www.tutorialspoint.com/analog_communication/analog_communication_introduction.htm
3. https://www.tutorialspoint.com/digital_communication/index.htm
4. https://www.tutorialspoint.com/Fiber-Optic-Communications
5. https://www.tutorialspoint.com/radar_systems/radar_systems_tutorial.pdf
6. https://www.tutorialspoint.com/satellite_communication/satellite_communication_introduction.htm

PEDAGOGY: Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

SKILL-BASED ELECTIVE COURSE - I

CAREER COMPETENCY SKILLS - I

SEMESTER : III **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHS01 **CREDITS 2**

OBJECTIVES

- To enhance employability skills and to develop career competency.
- To impart knowledge on preparing resume and group discussion.
- To develop the personality traits and interview skills.

LEARNING OUTCOMES

- Obtain knowledge of resume formats.
- Know how to lead a group.
- Know how to face an interview.

UNIT I RESUME FORMATS

Biodata – Resume – Curriculum vitae (CV) - Tips to create an effective resume – Resume format for various professions.

UNIT II GROUP DISCUSSION

Group discussion – Definition – Types of group discussion – Importance – Elements of group discussion – Skills for group discussion – preparation of group discussion.

UNIT III TECHNICAL APTITUDE

Basic aptitudes – Steps to prepare technical test – Critical reasoning skills – Common aptitude types - technical aptitudes for different professions

UNIT IV INTERVIEW SKILLS

Types of Interviews – Best skills for an Interview – Preparation for an Interview.

UNIT V PERSONALITY

Four personality types – Personality traits – Body language – Dress code – Ways to improve personality.

BOOK FOR STUDY AND REFERENCE

1. Ajai B. Kher, Group discussion, Vohra Publisher, Allahabad, India,
2. Ela Kashyap Sharma, Technical Aptitude for Interviews, PHI Learning Private Limited, Delhi, 2015
3. T.S. Jain and Gupta, UPKAR'S Interviews and group discussions, E-Books

WEBSITES FOR REFERENCE

1. https://enhancv.com
2. https://www.monsterindia.com
3. https://mbauniverse.com
4. https://www.naukri.com
5. https://www.businessnewsdaily.com
6. https://results.amarujala.com
7. UPSC pathshala (app)
8. Aptitude and Logical Reasoning App.

PEDAGOGY

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, and PowerPoint Presentation.

SKILL BASED ELECTIVE COURSE - II

COMPUTATIONAL METHODS AND PROGRAMMING IN – C

SEMESTER : V **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHS02 **CREDITS : 3**

OBJECTIVES

This course will provide the necessary basic concepts of errors in computing and a few numerical methods for finding zeros of non-linear functions. Further, will provide the basics of the C programming language.

LEARNING OUTCOMES

1. The student will be acquainted with the importance of errors in computing
2. The student will understand the various types of errors and their propagation in computing.
3. Will acquire the knowledge of iterative techniques for a nonlinear function.
4. Get exposure to the basics of the C programming language.

UNIT I ERRORS IN COMPUTING

Significant digits – Inherent Errors – Numerical Errors – Modelling Errors – Absolute and Relative Errors – Error Propagation – Conditioning and stability – Convergence of iterative process.

UNIT II ROOTS OF EQUATIONS

Algebraic, Polynomial, Transcendental equations – Methods of the solution – Iterative methods – Starting and stopping iterative process – Evaluation of polynomials – Bisection method – False Position method.

UNIT III C-FUNDAMENTALS

Character set – Keywords - data types – variable types - constants – identifiers – keywords – operators and expressions – Input and Output functions.

UNIT IV CONTROL STATEMENTS

(Syntax and examples for each) If – else, Nested if-else, Switch – Case, Break, While Loop, for loop, Do-While statement, go to.

UNIT V FUNCTIONS AND ARRAYS

Declaration and definition of a function– accessing a function – passing parameters to a function Defining an array – processing an array – single dimensional array – multidimensional array - simple programs (Addition, Subtraction, Multiplication of two matrices - Ascending and Descending order).

BOOKS FOR STUDY AND REFERENCE

1.E. Balagurusamy, Numerical Methods, McGraw Hill Publishers, 2017.

2. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 2012

3. E. Balagurusamy, Programming in ANSI C, McGraw Hill Publishers, 2019, 8thEdn.

4.. B. Gottfried, Schaum's Outline of Programming with C, McGraw Hill Publishers, 1996

WEBSITES FOR REFERENCE

https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/

https://onlinecourses.swayam2.ac.in/cec20_cs02/preview

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

SKILL-BASED ELECTIVE COURSE - III

INSTRUMENTATION

SEMESTER	**: V**	**HOURS/ WEEK**	**: 2**
SUBJECT CODE	**: 21UPHS03**	**CREDITS**	**: 3**

OBJECTIVES

- To study the instrument with its principle and observe the method of their functioning
- To provide a good foundation in measurements
- To inspire interest in the knowledge of concepts regarding measurements.

LEARNING OUTCOMES

- Acquire the knowledge of characteristics of an Instrumentation system.
- Understand the functions of Electrical, Digital, Medical and Pollution Monitoring Instruments.
- Know the various applications of the instruments.

UNIT I PERFORMANCE CHARACTERISTICS OF AN INSTRUMENTATION SYSTEM

Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration - Generalized measurement – Zero-order system – Second order system – Dead time element – Specification and testing of dynamic response.

UNIT II SENSORS AND TRANSDUCERS

Basic principles of sensors - pressure sensor (Strain Gauge) – IR sensor - Characteristics of transducers - variable resistance transducer -variable capacitance transducer – Voltage and current transducer.

UNIT III DIGITAL INSTRUMENTS

Introduction – Digital Multimeter – Digital panel meter – Digital frequency meter – Digital measurement of time – Universal counter – Digital tachometer – Digital PH meter.

UNIT IV MEDICAL INSTRUMENTATION

ECG - EEG - Lead systems and recording methods -typical waveforms - X-ray machine – Digital Stethoscope - Computer tomography - MRI – Ultrasonography - Thermography - Pacemakers –Ventilators - Dialyzers.

UNIT V GAS ANALYSERS AND POLLUTION MONITORING INSTRUMENTS

Types of gas analysers - Oxygen, NO_2 and H_2S types - IR analyser - Air pollution standards- Air pollution detector - Dust and smoke detector- Radiation monitoring instruments –Area radiation dosimeter- personal radiation dosimeter - radiation warning alarm.

BOOKS FOR STUDY AND REFERENCE

1. E.A.Doebelin, Measurement Systems-Applications and Design, Tata McGraw Hill, (1990)
2. C S Rangan, G R Sharma, V.S.V. Mani, Instrumentation Devices and Systems, Second Edition, Tata McGraw Hill, (2011)
3. R.S.Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill (2003).
4. D.Patranabis, Sensors and Transducers, Prentice Hall of India, (1999)
5. M. Arumugam, Bio-medical Instrumentation, Anuradha Agencies, (2002)
6. John G. Webster, Medical Instrumentation: Application and Design, John Wiley &Sons Inc (2009)
7. John P. Bentley Principles of Measurement Systems, Third Edition, Pearson Education, (2000)

WEBSITES FOR REFERENCE

1. https://www.electronicshub.org/ir-sensor/
2. https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics
3. https://www.elprocus.com/what-is-digital-frequency-meter-and-its-working/#:~:text=What%20is%20Digital%20Frequency%20Meter%3F%20Definition%3A%20A%20digital,range%20of%20frequencies%20between%20104%20to%20109%20hertz.

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

SKILL BASED ELECTIVE COURSE - IV

MICROPROCESSOR AND ITS APPLICATIONS

SEMESTER : VI **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHS04 **CREDITS : 3**

OBJECTIVES

This course will provide the necessary basic concepts about the 8085 microprocessor's architecture and various functions. It will provide ideas about programming in the microprocessor.

LEARNING OUTCOMES

- The student will be able to describe the general architecture and organization of 8085 microprocessors.
- Will be able to understand the various functional units and memory modes.
- Will understand the instruction sets and simple programming techniques.
- Will be able to write simple programming.

UNIT I ARCHITECTURE

8085 Microprocessor – Functional Units (Accumulator, ALU, Register, Counter, Stack Pointer, Flag Register) – 8085 Architecture Block diagram – Pin configuration (Pin diagram).

UNIT II ADDRESSING MODES

Immediate addressing – Register addressing – Direct addressing – Indirect addressing – Implied addressing.

UNIT III INSTRUCTION SETS

Control Instructions – Logical instructions – Branching instructions – Arithmetic instructions – Data transfer instructions – Instructions format – Instruction timings and operation status.

UNIT IV PROGRAMMING TECHNIQUES

Looping – Counting – Indexing – Counter and Time delays – Stack and Subroutines.

UNIT V PROGRAMMING AND APPLICATIONS

Executing a simple program – Addition – Subtraction – Multiplication and division - Ascending order – Descending order - Household devices – Industrial applications.

BOOKS FOR STUDY

1. R. Gaonkar, Microprocessor Architecture, Programming and Application with 8085, Pegram International Publications, 2013, 6thEdn.

2. Udayakumar and Umashankar, The 8085 Microprocessor: Architecture, Programming and Interfacing, Pearson, 2008, 1st Edn.

BOOKS FOR REFERENCE

1. D. V Hall, SSSP Rao, Microprocessors and interfacing, McGraw Hill Education, 2017, 3rd Edn.
2. C.M. Gilmore, Microprocessors Principles and Applications McGraw Hill Education, 1993

WEBSITES FOR REFERENCE

https://onlinecourses.nptel.ac.in/noc20_ee42/preview

https://www.javatpoint.com/microprocessor-applications

PEDAGOGY

Chalk and talk lectures, Group Discussion, Seminar, Interaction and PowerPoint Presentation etc.

NON MAJOR ELECTIVE COURSE – I

PHYSICS IN EVERYDAY LIFE

SEMESTER : III **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHN01 **CREDITS : 2**

OBJECTIVES

To introduce some concepts of physics life mechanics, properties of matter, Heat, Sound, Electricity and Magnetism for day to day applications.

UNIT I MECHANICS

Motion, Force and Newton's laws – momentum – projectile and circular motions – gravitation – planetary motion and earth satellites – communication satellites – work, power and energy – energy and environment – rotational motion.

UNIT II PROPERTIES OF MATTER

Three states of matter – binding forces – fluid pressure and thrust – applications – Pascal's law – Archimedes principle – capillary action – Bernoulli's principle – Viscosity.

UNIT III HEAT AND SOUND

Measurement of heat and temperature – clinical thermometer – heat transfer – Thermo flask – change of state - effect of the pressure of boiling point and melting point – heat engines – steam engine and diesel engine – sound and music – reverberation – the acoustics of building – recording and reproduction of sound in film

UNIT IV ELECTRICITY AND MAGNETISM

Coulomb's law – the action of points, lightning arrester – Ohm's law – electric power – electricity safety – electromagnetic induction – Faraday's law – Lenz law – transformers – mariner's compass.

UNIT V OPTICS

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

BOOKS FOR STUDY AND REFERENCE

1. R. Murugeshan, Allied Physics I & II, S. Chand & Co, New Delhi (2006).
2. D.S. Mathur, Elements of properties of matter and acoustics, S. Chand & Company Ltd., New Delhi(2010)
3. R.Murugeshan, Properties of matter and acoustics, S. Chand & Co, New Delhi(2012)

4. Brijal&Dr.N. Subramanyan and P.S. Hemne, Heat and Thermodynamics, S. Chand & Co, New Delhi, (2004)
5. R. Murugeshan, Electricity, S. Chand & Co, New Delhi (2010)
6. R. Murugeshan and KiruthigaSivaprasath, Modern Physics, S. Chand & Co, New Delhi (2016)
7. N. Subramaniyam, Brijlal and M.N.Avadhanulu, A textbook of Optics S. Chand & Co, New Delhi (2012)

WEBSITES FOR REFERENCE

1. https://www.khanacademy.org/science/physics/forces-newtons-laws
2. https://en.wikipedia.org/wiki/Archimedes%27_principle
3. https://www.toppr.com/guides/science/heat/heat-and-measuring-temperature/
4. https://en.wikipedia.org/wiki/Coulomb%27s_law

PEDAGOGY

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, PowerPoint Presentation.

NON MAJOR ELECTIVE COURSE– II

NON CONVENTIONAL ENERGY SOURCES

SEMESTER : IV **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHN02 **CREDITS 2**

OBJECTIVES

To make the students understand the basic principles of real-time applications of non-conventional energy sources.

UNIT I SOLAR ENERGY

Solar radiation – Solar radiation outside the earth's atmosphere Solar radiation at the earth's surface – Solar Thermal Energy – Solar Thermal devices and systems: Solar water heater – Subcomponents of solar water heater – Solar Cooker and its merits and demerits.

UNIT II WIND ENERGY

Power in the wind - Types of wind energy systems – Horizontal axis wind Turbine – Vertical axis wind Turbine.

UNIT III OCEAN ENERGY

Tidal Energy – Ocean Thermal Energy Conversion (OTEC) – Closed Cycle OTEC system – Open Cycle OTEC System.

UNIT IV ENERGY FROM BIOMASS

Biomass feedstock – water material – energy crops – important properties of biomass – conversion of biomass to gaseous fuels – anaerobic digestion – thermal gasification.

UNIT V GEOTHERMAL ENERGY

Introduction – Estimates of Geothermal power – Nature of Geothermal fields – Geothermal sources – Advantages and Disadvantages of geothermal energy – Applications of geothermal energy.

BOOKS FOR STUDY AND REFERENCE

1. Sukhatme S.P, Solar Energy, Wiley publications, 1975, 1st edition.
2. Rai. G.D, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 1st edition.
3. Rai. G.D, Solar Energy Utilization, Khanna Publishers, 1987, 1st edition.
4. Yogi. D Goswami, Frank Kieth and Jan F. Kredler, Principles of Solar Engineering, Tailor & Francis, 2003, 1st edition.
5. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers,1986.

PEDAGOGY

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, PowerPoint Presentation.

ALLIED PHYSICS – I

SEMESTER : I / III **HOURS/ WEEK : 4**

SUBJECT CODE : 21UPHA01 **CREDITS : 4**

OBJECTIVES

- To inculcate the concepts of various properties of matter.
- To impart the knowledge on the basic principle of mechanics, Heatwaves, Electricity and Magnetism

LEARNING OUTCOMES

- Acquire the knowledge of various properties of matter.
- Help to understand the natural physical process.
- Explain the basic concept of temperature and specific heat mechanics.
- Acquire knowledge of sound waves and their application.
- Describe the fundamentals of electricity and magnetism.

UNIT I PROPERTIES OF MATTER

Elasticity – Bending of beams – Expression for bending moment – Expression for Young's Modulus (uniform and non-uniform bending) – expression for a couple per unit twist – Rigidity Modulus by Torsional pendulum, viscosity, Stoke's formulae – Poiseuilles flow method – Molecular energy – Surface tension – excess pressure inside curved surface – spherical and cylindrical drops.

UNIT II MECHANICS

Projectile motion: Definition of Range, Time and Flight and Angle of projection – Maximum range of projection – Circular motion - tangential acceleration in a circular motion – Gravitation: Newton's Law of gravitation – inertial mass – Gravitational mass – Kepler's law of gravitation - Planetary motion – deduction of Newton's law of gravitation from Kepler's law – determination of G by Boy's experiment – a variation of g with latitude and depth.

UNIT III MECHANICAL WAVES

Waves in strings and pipes: Velocity of a transverse wave along a stretched string – velocity of sound in gases – Newton's formulae for velocity sound – effect of temperature, pressure, humidity and density of medium on sound. Ultrasonics and Acoustics: Ultrasonics – piezoelectric effect – deflection of ultrasonics – applications – reverberation time and Sabine's law – absorption coefficient – conditions for good acoustical design of buildings.

UNIT IV HEAT

Vander Waal's equation of state – critical constants – determination of critical constants – Joule-Kelvin effect – Porous plug experiment – theory of porous plug experiment – temperature inversion – Liquefaction of gases – liquefaction of Hydrogen – Thermal conductivity – coefficient of thermal conductivity – determination of coefficient of thermal conductivity of bad conductor by Lee's disc method.

UNIT V ELECTRICTY& MAGNETISM

Coulomb's law – Action of points – lighting arrester – Faraday's law – transformers. Electric circuit – open circuit – closed circuit – switches types of switches – types of fuses – rewireable type fuse – cartridge fuse – circuit breakers. Different types of magnetic materials(dia, para, Ferro, and antiferro) – Langevin's theory of diamagnetism – general properties of superconductors – type I &type II superconductors.

BOOKS FOR STUDY AND REFERENCE

1. R.Murugeshan, Allied Physics I & II, S. Chand & Company Ltd., New Delhi (2006)
2. D.S. Mathur, Elements of properties and acoustics, S. Chand & Company Ltd., New Delhi(2010).
3. R.Murugeshan, Properties of matter and acoustics, S.Chand& Co, New Delhi(2012)
4. Brijlal&Dr.N.Subramanyam and P.S. Hemne, Heat and Thermodynamics, S.Chand&Co, New Delhi,(2004)
5. R. Murugesan, Electricity, S.Chand& Co, New Delhi(2010)
6. Halliday/Resnik/Krane, Physics – Vol I&II, John Willey & Sons 6^{th} edition extended.

PEDAGOGY

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, PowerPoint Presentation.

ALLIED PHYSICS – II

SEMESTER : II/ IV **HOURS/ WEEK : 4**

SUBJECT CODE : 21UPHA02 **CREDITS : 4**

OBJECTIVES

- To impart knowledge on the basic concepts of Atomic, Nuclear and Solid State Physics, Electronics and Digital Electronics.
- To acquire knowledge on their applications

LEARNING OUTCOMES

- Understand the principles of the atom and nuclear models
- Understand the structure and bonding in crystals
- Familiar with the basic analog and digital electronic circuits.

UNIT I – ATOMIC PHYSICS

The vector atom model – spatial quantization – the spinning of an electron – quantum numbers associated with the vector atom model – coupling schemes – LS and JJ coupling – Pauli's exclusion principle – Stern and Gerlach experiment – X-rays – production of X- rays – Continuous and characteristic X-ray spectra – Bragg's law powder X-ray diffractometer – industrial and medical applications of X-rays.

UNIT II NUCLEAR PHYSICS

General properties of nuclei: Nuclear mass and binding energy – B.E/A versus A curve – nuclear spin and magnetic moment – mass, half-life and spin of neutron – semi-empirical mass formula – Nuclear models and elementary particles: nuclear reactions: cross-section – nuclear fission – liquid drop model – nuclear forces – elementary particles: classification – Quarks and leptons.

UNIT III SOLID STATE PHYSICS

Crystal lattice – unit cell – Primitive cell – Basis – Classification of crystals – Bravais lattice as three dimensions – Miller indices and crystal planes - crystal structure – simple cube – body-centred cube – face-centred cube – co-ordination number – atomic radius – packing factor of a simple cubic crystal. Bonding in crystals – ionic bond – covalent bond – metallic bond – molecular bond – hydrogen bond – their properties.

UNIT IV ELECTRONICS

Theory of energy bands in crystals – the distinction between conductors, insulators and semiconductors – intrinsic and extrinsic semiconductors – Zener diode characteristics – break down voltage – Zener diode as a voltage regulator.

Operational amplifier: Ideal operational amplifier – characteristic of an operational amplifier – Inverting and Non inverting amplifiers –Differential amplifier –CMRR – OP amp as a comparator.

UNIT V DIGITAL ELECTORNICS

Number systems – Binary – Octal – Hexadecimal – Boolean Algebra – simplification of Boolean Algebra – De Morgan's theorem and its verification – Basic logic gates – OR, AND, NOT, NAND, NOR, EX-OR gates – logic gates using diodes and transistor(OR, AND, NOT) - NAND & NOR as a Universal Building Block –Half and full Binary adders.

BOOKS FOR STUDY AND REFERENCE

1. R.Murugeshan, Allied Physics I & II, S. Chand & Co, New Delhi(2006)
2. R.Murugeshan and KiruthigaSivaprasath, Modern Physics, S. Chand & Co, New Delhi(2016)
3. Malvino& Leach, Digital Principles & applications, Tata McGraw Hill, 1995, 5th edition.
4. Kittel, Solid-state Physics, Wiley student edition,2007,8th edition.
5. Principles of Electronics, V. K. Mehta S. Chand & Co, New Delhi. 2003

PEDAGOGY

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, PowerPoint Presentation.

ALLIED PHYSICS PRACTICAL

SEMESTER : VI **HOURS/ WEEK : 2**

SUBJECT CODE : 21UPHAP01 **CREDITS 4**

OBJECTIVES

It is aimed at exposing the undergraduate allied students to the technique of handling simple measuring instrument and also make them measure certain properties of materials.

LIST OF EXPERIMENT (ANY FOURTEEN ONLY)

01. Young's modulus (q) – non-uniform bending – pin and microscope
02. Young's modulus (q) – uniform bending – scale and telescope method.
03. Static Torsion – Rigidity modulus of a rod.
04. Torsion Pendulum – Rigidity modulus of a wire.
05. Surface tension and interfacial surface tension of a liquid–drop weight method.
06. Sonometer – frequency of a tuning fork.
07. Sonometer – AC frequency
08. Air Wedge – thickness of a wire.
09. Post office Box – Determination of energy Band Gap of the thermistor.
10. Spectrometer – Refractive index of a solid prism.
11. Spectrometer – grating–normal incidence–Determination of wavelength-mercury lamp.
12. Determination of viscosity using a graduated burette.
13. Specific heat capacity of a liquid – half time correction.
14. Potentiometer – calibration of an ammeter.
15. Potentiometer – calibration of low range voltmeter.
16. C.F.Bridge – Determination of Specific Resistance of a coil.
17. Characteristics of Zener diode.
18. Verification of truth tables of AND, OR & NOT gates using ICs.
19. Construction of low range power pack using two diodes.
20. Verification of De Morgan's theorems.

BOOKS FOR STUDY AND REFERENCE

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan Chand and sons educational publishers, New Delhi. Edition 2017
2. M.K Subramanian, S.Padmanathan, S.Somasundaram, B.Sc Allied Physics Practical, Apsara Publications, Trichy, revised edition 2020.
3. C.C.Ourseph, C.Rangarajan, R. Balakrishnan – A Text Book of Practical Physics – S.Viswanathan Publisher – Part II (1996)
4. S.L. Gupta and V.Kumar – Practical Physics – PragatiPrakashan – 25th Edition (2002).

PEDAGOGY

Demonstration and practical Sessions.