4

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
	MECHANICS				

05

#### **SEMESTER I**

**OBJECTIVE** 

22UPY01

The students are able to

AND SOUND

Give the fundamental ideas on conservation laws, rotational and vibrational motion • of rigid bodies, Gravitational fields and some idea about fluid mechanics.

70

- Give the knowledge about laws of impact, moment of inertia theorems, laws of friction, equation of continuity and simple harmonic principles and its applications.
- Analyze and apply the knowledge of center of gravity, center of pressure, production of ultrasonic and acoustics of buildings.
- Apply the concept of sonameter and melde's apparatus to determine the frequency of AC mains.
- Calculate problems based on loss of K.E due to impact, Sabine's formula, acceleration due to gravity, radius of gyration and the absorption coefficient of a absorption substance in an auditorium.

#### **SYLLABUS**

#### **UNIT I: LAWS OF MOTION**

Laws of conservation of energy - linear momentum and angular momentum - work energy theorem - work done by gravitational force - potential energy - conservative and non-conservative forces

#### **IMPACT:**

Elastic and inelastic collision - laws of impact - Impact of a smooth sphere on a fixed plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact.

#### **UNIT II DYNAMICS OF RIGID BODY**

Moment of inertia - Theorems of perpendicular and parallel axes - M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes -Compound pendulum - theory - equivalent simple pendulum - reversibility of centers of oscillation and suspension – determination of g and k.

#### UNIT III: STATICS AND HYDRODYNAMICS

Friction-laws of friction-angle of friction-cone of Friction-Centre of gravity-solid and hollow tetrahedron- solid and hollow hemisphere - Centre of pressure - vertical rectangular lamina - vertical triangular lamina. Hydrodynamics - Equation of continuity -

#### **15 HOURS**

# **15 HOURS**

**15 HOURS** 

**15 HOURS** 

Pitot's tube and Venturimeter –Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and its applications.

#### **UNIT IV: SOUND**

Simple Harmonic Motion –Composition of two S.H.M in a straight line-at right angles- Lissajous's figures- Definition of Free, Damped, Forced vibrations - Resonance -Fourier theorem - application. Laws of transverse vibration of strings – Sonometer -Determination of AC frequency using sonometer - Determination of frequency using Melde'sapparatus - noise pollution.

#### **UNIT V: ULTRASONICS AND ACOUSTICS**

Ultrasonics - Production - Piezoelectric crystal method - Magnetostriction method -Properties and Applications - Acoustics of building – Reverberation time - Sabine's formula - determination of absorption coefficient - Factors affecting acoustics of building-Sound distribution in an auditorium- Requisites for good acoustics.

#### **TEXT BOOKS**

- Mechanics Part I and II by Narayanamoorthy, National Publishing Company. (2001).
- 2. Mechanics, by D.S.Mathur, S.Chand& Co., 2ndEdition, (2001).
- Mechanics, by P. Duraipandian, LaxmiDuraipandian, Muthamizh Jayapragasam, S.Chand & Co., New Delhi, (1988).
- 4. Properties of Matter, by R.Murugeshan, S. Chand & Co., New Delhi (2001).

#### **REFERENCE BOOKS**

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6<sup>th</sup> edition, Wiley, NY, (2001).

#### WEB RESOURCES

1. https://ocw.mit.edu/courses

2. http://www.vidyarthiplus.in/2011/11/engineering-physics-1-ultrasonics.html 3. <u>http://www.ngmc.org/wp-content/uploads/2019/06/B.Sc .-</u> <u>Mathematics Dynamics-17UMA305.pdf</u> COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Define the Laws of motion, impact, simple harmonic motion, laws of friction; and give the application of ultrasonics	Remember
C02	Explain the concept of impact between two smooth spheres, parallel and perpendicular theorem of moment of inertia, center of pressure, equation of continuity and free, damp and un-damp vibrations	Understand
CO3	Determine the value of g and k using compound pendulum and Analyze different applications for Bernoulli's theorem	Apply
CO4	Determine the AC frequency using Sonometer and Melde's apparatus and to determine the center of gravity for various applications	Apply
C05	Calculate problems based on sabine's formula and the absorption coefficient, loss of K.E due to impact.	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	S	S	L		L	S		
CO2	М	S	S	S	М	М				S
CO3	М	М		М	S	М		М		
CO4	М	М			S		L	М	М	
C05	М	L	S		S		-	-	-	

#### **SEMESTER I**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY02	HEAT AND THERMODYNAMICS	70	05	-	4

#### OBJECTIVE

• To understand the phenomena connected with various units of measurement of temperature, knowing the concept of specific heat capacities of matter, transmission of heat, concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.

#### SYLLABUS

#### **UNIT I: THERMOMETRY AND CALORIMETRY**

Platinum resistance thermometer - Thermoelectric effect -Seebeck effect -Thermoelectric thermometers - International temperature scale – Thermistor - Specific heat capacity of solids - Regnault's method of mixtures (solid) - specific heat capacity of liquids - determination of specific heat capacity of a liquid by Newton's law of cooling-Specific heat capacity of gases - Cp and Cv - Meyer's relation -Cv by Joly's differential steam calorimeter method -Cp by Regnault's method.

#### **UNIT II: LOW TEMPERATURE PHYSICS**

Vander waal's equation of gaseous state- Determination of critical constants -Joule -Thomson effect - Porous plug experiment - Joule-Kelvin effect - Liquefaction of Air -Linde's Process - liquefaction of hydrogen - liquefaction of helium - Helium I and II production of low temperatures - adiabatic demagnetization- practical applications of low temperature - refrigerators and air-conditioning machines.

#### UNIT III: TRANSMISSION OF HEAT

Conduction - coefficient of thermal conductivity - Rectilinear flow of heat along a bar - convection - lapse rate - Stability of the atmosphere - Radiation - black body -Kirchhoff's law - Stefan - Boltzmann law - energy distribution in black body spectrum -Wien's law - Rayleigh Jean's law - Planck's law - solar constant - water flow pyroheliometer.

#### **UNIT IV: THERMODYNAMICS**

Zeroth, first and second law of thermodynamics – Adiabatic and isothermal processes - reversible and irreversible processes - carnot cycle and its efficiency - Carnot's theorem – Heat engines – Carnot's petrol and diesel engines – their efficiency - entropy – change in entropy in reversible and irreversible processes – Third law of thermodynamics – temperature - entropy diagram.

#### **15 HOURS**

**15 HOURS** 

**15 HOURS** 

#### UNIT V: MAXWELL'S THERMODYNAMICAL RELATIONS

**15 HOURS** 

Zero point energy – Derivations of Maxwell's thermodynamic relations – applications - Helmholtz function - Gibb's function - Enthalpy - Relation between specific heats and joule – Kelvin coefficient - Clausius - Clapeyron's latent heat equation – T dS equations.

#### **TEXT BOOKS**

1. Heat and Thermodynamics, Brijlal and Subramanyam, S. Chand & Co, 16th Edition New Delhi, (2005).

2. Heat and Thermodynamics, D.S. Mathur, Sultan Chand & Sons, 5thEdition, New Delhi, (2014).

3. Thermal Physics, R. Murughesan and Kiruthiga Sivaprasath, S. Chand & Co, II Edition, New Delhi, (2008).

#### REFERENCE BOOKS

1. Heat & Thermodynamics, J.B. Rajan, SC Publisher, New Delhi, (1985).

2. Concepts of Physics Volume I and II, H.C. Varma, Bharati Bhawan Publishers, New Delhi, (2015).

3. M. Narayanamoorthy and N. Nagarathinam, Heat & Thermodynamics, National publishing Co, Chennai, Eight Edition, (1987).

WEB RESOURCES

1.https://www.ucc.ie/en/physics/wiphysics/resources/heatthermodynamicsresources 2.http://www.freebookcentre.net/Physics/ThermoDynamics-Books.html

3.https://ocw.mit.edu/high-school/physics/exam-prep/kinetic-theoryhermodynamics/laws-of-thermodynamics/

# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Define the fundamental of thermodynamic properties and Use thermodynamic terminology correctly	Remember
C02	Analyze the basic thermodynamic Carnot's petrol and diesel engines	Understand
CO3	Derive and discuss the laws of thermodynamics	Apply
CO4	Solve problems using the properties and relationships of thermodynamic fluids.	Apply
C05	Develop and apply the specific heat capacity of solid materials	Apply

# **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	L	М	S	М			М	S		
CO2		S	S	S	L	L	М			
CO3		S	S	М		L		L		
CO4	S	S	S	S		L	L	L		
CO5	S	S	S	М	М	L	М	L		

<b>SEMESTER I</b>
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Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYP1	Physics Practical - I	-	10	140	4

#### OBJECTIVE

- To develop higher-order thinking competencies through experimental understandings on physical concepts.
- To verify and validate the concepts, principles and hypotheses related to the phenomena of Physics.
- To enhance the cognitive ability of the learner to think on their own towards their skill development.
- Enable them to acquire a job efficiently in diverse fields such as Science and Engineering, Education, Banking, Administrative and Public services, Business etc., through experimental skill.

#### List of Practical experiments - Any Sixteen of the following:

- 1. Young's modulus Non uniform Bending Pin & Microscope method-Determination of unknown mass
- 2. Young's modulus Non uniform bending Scale and Telescope method (two lengths)
- 3. Torsion pendulum Rigidity Modulus (without mass)
- 4. Compound pendulum- Determination of g
- 5. Surface tension and interfacial surface tension Drop Weight method
- 6. Sonometer frequency of a tuning fork
- 7. Sonometer -Relative Density of a solid & liquid.
- 8. Sonometer frequency of AC mains.
- 9. Specific heat capacity of a liquid Method of a mixtures half time correction
- 10. Spectrometer Refractive index of a solid Prism
- 11. Spectrometer i d curve
- 12. Spectrometer Grating Standardization normal incidence- Measurement of Wavelength of Mercury Spectrum
- 13. Potentiometer Calibration of low range Voltmeter
- 14. Figure of merit of a Sensitive Galvanometer.
- 15. Field along the axis of a coil Deflection magnetometer  $B_{\rm H}$
- 16. Post Office Box Temperature coefficient of resistance
- 17. Characteristics of PN junction diode
- 18. Zener diode Voltage regulator
- 19. Verification of Basic logic gates Using ICs.
- 20. NAND/NOR gate as Universal Building Block

#### **REFERENCE BOOKS**

- 1. Advanced Practical Physics for Students B.L. Flint, H.T. Worsnop, Methuen & Co. Ltd., (1957).
- 2. Practical Physics, G. L. Squires, Cambridge University Press, (ISBN 10: 0522770459), 2001.
- 3. Practical Physics, R.K. Sukhla, Anchal Srivatsava, (2009), ISBN 10: 8123417485.

#### WEB RESOURCES

1. https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html

- 2. https://vlab.amrita.edu/index.php?sub=1&brch=74
- 3. https://vlab.amrita.edu/index.php?sub=1&brch=192

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Able to reminiscent the physical concepts and fundamental laws behind experimental observations and their measurable physical quantities.	Remember
C02	Comprehend the theory of natural phenomena on the basis of Physics conceptual aspects and the experimental objectives. Able to understand the limitations of the measuring device and its suitability based on the mechanism, error factors and least count, etc.	Understand
CO3	Observed physical concepts to develop technology for the societal upgradations. Interpreting the basis of fundamental laws of physics on day-to-day life events by personal investigations.	Apply
CO4	Able to choose the appropriate measuring tool suitably for the specific experimental observation based on their working mechanism and functionalities.	Apply
C05	Able to sequencing the experimental procedures and order required for the experimental investigations.	Apply

### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	М		S	S	L	S	L	L	S	L
CO2			S	S	S	S	М	М	S	
CO3	М		S	S	М	L	L	М	S	L
CO4	S	L	L	S	М	L	L	L	S	М
CO5	-	-	L	L	М	L	L	-	S	М

	SEMESTER	III		
e name	Lecture(L)	Tutorial(T)	Practical(P)	Cr

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY03	PROPERTIES OF MATTER	70	05	-	4

#### OBJECTIVE

- The students will learn all physical properties of matter through an activity based.
- Student will describe the specific physical properties of all matter.
- Though completing the challenge students will able to identify and describe properties of matter.

#### SYLLABUS

#### UNIT I - ELASTICITY:

Elasticity –- Hooke's law – Elastic moduli – Poisson's ratio – Beams – bending of beams – Expression for bending moment –Cantilever- Theory of uniform and non – uniform bending - Determination of young's modulus -Koenig's method – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum) and static torsion method.

#### **UNIT II- SURFACE TENSION:**

Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a spherical and cylindrical drops and bubbles-drop weight method- angle of contact- Quincke's method-variation of surface tension with temperature-experimental determination-Jaegar's method.

#### **UNIT III- VISCOSITY:**

Viscosity – Co efficient of viscosity – Streamlined and turbulent motion –critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula –viscosity of highly viscous liquid-terminal velocity-Stoke's method-Ostwald Viscometer--viscosity of gas-Mayer's formula-Rankine 's method

#### **UNIT IV- GRAVITATION**

Gravitation - Newton's law of gravitation - determination of gravitational constant - Boy's method- Mass and Density of earth - Expression for gravitational potential at a point-Gravitational potential and field due to a spherical shell and a solid sphere -Variation of g with latitude, depth and altitude.

#### **UNIT V- DIFFUSION & OSMOSIS**

Diffusion - Graham's laws of diffusion - Fick's laws of diffusion -Determination of diffusivity - Graham's law of diffusion of gases - effusion of gases - transpiration.

#### **15 HOURS**

**15 HOURS** 

**15 HOURS** 

**15 HOURS** 

Osmosis - experimental determination of osmotic pressure - laws of osmotic pressure - osmosis and vapour pressure of a solution - osmosis and boiling point of a solution - osmosis and freezing point of a solution.

#### **TEXT BOOKS**

1. Fundamentals of General Properties of Matter, H.R. Gulati, S.Chand and Co., (2005).

2. Properties of Matter, SubramaniyaIyer, Rangarajan and Viswanathan, (2005).

#### **REFERENCE BOOKS**

- 1. Properties of matter, R. Murugesan, S.Chand and Co., (2005).
- 2. Properties of matter, Brijlal and N.Subrahmanyam, S. Chand and Co., (2005).
- 3. Elements of properties of matter, D.S.Mathur, S.Chand and Co.,

#### WEB RESOURCES

<u>1. uk.life123.com</u> <u>2. uk.directhit.com</u> <u>3. https://manoa.hawaii.edu</u>

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Learning the basics concepts of elasticity, surface tension, gravitation, viscosity and diffusion & osmosis	Remember
CO2	Understand the concepts of properties of matter and to recognise their applications in various real problems	Understand
CO3	Determine the value of gravitational constant and Analyze different applications for Graham's law of diffusion of gases	Apply
CO4	Recall the Basic principles and basic equations and apply them to day-to-day problems	Apply
C05	Formulate the equations for unique cases in the diverse categories of material systems	Apply

#### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	М	М	S	S	S	М	М	М	L	L
CO2	L	М	S	S	S	L	М	М	S	L
CO3	М	М	S	М	S	S	S	S	L	М
CO4	L	М	М	М	S	М	М	S	L	М
CO5	L	М	М	М	S	М	L	L	L	L

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYS1	Python	25	05	_	2

#### **SEMESTER III**

**Objectives** 

- 1. To learn and understand Python programming basics and paradigm.
- 2. To learn and understand python looping, control statements and string manipulations.
- 3. Students should be made familiar with the concepts of GUI controls and designing GUI applications.
- 4. To learn and know the concepts of file handling, exception handling and database connectivity.
- 5. To acquire programming skills in core Python.
- 6. To acquire Object Oriented Skills in Python

**Programming** 

- 7. To develop the skill of designing Graphical user Interfaces in Python
- 8. To develop the ability to write database applications in Python

#### SYLLABUS

#### UNIT I

#### Introduction to Python Programming Language

Introduction to Python Language - Strengths and Weaknesses - IDLE, Dynamic Types -Naming Conventions - String Values - String Operations - String Slices - String Operators -Numeric Data Types – Conversions - Built In Functions.

#### UNIT II

Introduction - Control Flow and Syntax – Indenting - The if Statement - Relational Operators – Logical – Operators - True or False - Bit Wise Operators - The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

#### UNIT III

Classes in Python - Principles of Object Orientation - Creating Classes - Instance Methods - File Organization - Special Methods - Class Variables - Inheritance - Polymorphism -Type Identification - Custom Exception Classes

#### **UNIT IV**

Introduction - Defining Your Own Functions - Parameters - Function Documentation - Keyword and Optional Parameters - Passing Collections to a Function - Variable Number of Arguments - Scope – Functions.

#### 6 HOURS

**6 HOURS** 

#### **6 HOURS**

#### UNIT V

#### 6 HOURS

Passing Functions to a Function - Mapping Functions in a Dictionary - Lambda - Modules -Standard Modules – sys - Standard Modules – math - Standard Modules – time - The dir Function

#### **TEXT BOOKS**

- 1. Dive into Python, Mark Pilgrim, Apress Publications, (2005).
- 2. Learning Python, Mark Lutz, 4th Edition, Shroff O'reilly Publishers, (2009).
- 3. Programming Python, 4th Edition by Mark Lutz, O'reilly Publishers, (2011).

#### **REFERENCE BOOKS**

- 1. Fluent Python: Clear, Concise, and Effective Programming, Luciano Ramalho, O'reilly Publishers, (2015).
- 2. Learn Python 3 The Hard Way, Zed A. Shaw, Addison-Wesley Publications; 1st edition (2017).
- 3. Head First Python: A Brain-Friendly Guide, Paul Barry, O'reilly Publishers, (2016).

WEB RESOURCES

- 1. https://programminghistorian.org/
- 2. https://python.org
- 3.https://pythonhow.com

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Define IDLE, Dynamic Types, String values and operations, and demonstrate the use of built-in functions	Remember
CO2	Explain basic principles of Python programming language	Understand
CO3	Design and implement a program to solve a real world problem	Apply
CO4	Implement object oriented concepts	Apply
CO5	Implement database and GUI applications.	Apply

#### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P7	P08	P09	P010
CO1	S	S	S				М	S	S	S
CO2		S	S	М		L	М		S	S
CO3		S		М		L		М	S	S
CO4	S	S				L	L	М	S	S
CO5	S	S	S	М	М	L	-	-	S	S

**6 Hours** 

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYN1	MAINTENANCE OF DOMESTIC APPLIANCES	25	05	-	2

#### **SEMESTER III**

OBJECTIVE

The students are able to

- Give the fundamental ideas on diodes, transistors, tube light, fan, refrigerator and cell phones.
- Analyze and apply the knowledge of home appliances maintenance in our day to day life.

SYLLABUS

#### UNIT – I: PASSIVE COMPONENTS AND THEIR TESTING: 6 Hours

Resistors – Failures in fixed resistors– testing of resistors –variable resistors– variable resistors as potentiometers– Capacitors– Types of capacitors– testing of capacitors and precautions, Inductors – Testing of inductors.

#### UNIT – II : ACTIVE COMPONENTS AND THEIR TESTING: 6 Hours

Construction, Characteristics and testing procedure of Diodes. List the Special types of diodes (tunnel, variable, gunn, LED) -Construction, Characteristics and testing procedure of Transistors, FieldEffect Transistors, Thyristors.

#### UNIT – III: MAINTENANCE AND REPAIRING LIGHTS: 6 Hours

Tube light – Circuit in tube lights - Faults in Tube Lights - Replacing Tube Light and its components –Fluorescent Light – Working of Fluorescentlight – Identifying the problem – Steps to replace a fluorescent light and its components.

#### UNIT – IV: MAINTENANCE AND REPAIRING FANS AND REFRIGERATOR 6 Hours

Fan - Ceiling Fan - Pedestrian Fan – Refrigerator maintenance - Common Problems.

#### UNIT – V: CELLULAR PHONE SERVICING

Cellular phone - Cell Phone Power Button, Screen, Keyboard, Battery and Camera Replacement & Repair.

#### **TEXT BOOKS**

- 1. Hand book of repair and maintenance of domestic electronic appliances, shashibhushan Sinha, BPB publications, (2016).
- 2. Fundamentals of electrical engineering , Gupta kumar.

#### **REFERENCE BOOKS**

- 1. Basic Electronics, B.L. Theraja.
- 2. Modern mobile phone repairing, Manahar lotia, BPB publications, (2006).

#### WEB RESOURCES

- 1. <u>https://www.mrright.in/ideas/appliances/home-appliances-care-and-maintenance-tips/</u>.
- 2. <u>http://courseware.cutm.ac.in/courses/repair-and-maintenance-of-home-appliances/</u>

#### COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Explain the working concept of fan, tube light, refrigerator and cell phones	Remember
C02	Apply the knowledge of domestic appliances in their higher studies or self-employment	Apply
C03	Apply the knowledge of maintenance of domestic appliances in day to day life	Apply

#### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01		S	М			L			М	
CO2		S	М		L					М
CO3		М	S			М		L		

<b>SEMIESIEI</b>	X I V	

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY04	OPTICS AND SPECTROSCOPY	70	05	-	4

CEMECTED IV

#### OBJECTIVE

- To understand the concept of aberrations in lenses and prisms.
- The students will learn optical properties like diffraction, interference, polarization and spectroscopy.
- This paper aims to impart a detailed knowledge in Optics & Spectroscopy.

#### SYLLABUS

#### **UNIT I - Geometrical optics:**

Lens – Spherical aberration in lenses – Methods of minimizing spherical aberration – chromatic aberration in lenses – condition for achromatic of two thin lenses (in and out of contact) –Aplanatic lens –Dispersion – Angular andChromatic dispersion – combination of prisms to produce i)dispersion without deviation ii) deviation without dispersion –Direct vision spectroscope –Eyepieces – Ramsden's and Huygens's eyepieces – simple microscope (magnifying glass) – compound microscope.

#### **UNIT II- Interference:**

Conditions for interference – Theory of interference fringes – interference due toreflected light (thin films) -colours of thin films – wedge shaped thin film –theory – determination of diameter of a thin wire by Air wedge –Newton's rings by reflected light – Determination of wavelength oflight - Michelson's Interferometer – theory and its Application (Measurement of wavelength) – Jamin's interferometers.

#### **UNIT III- Diffraction:**

Fresnel's diffraction – Rectilinear propagation of light – zone plate – action of zone plate - diffraction at circular aperture – opaque circular disc – Fraunhofer diffraction at single slit – Double slit – Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength(Normal incidence method) – resolving power–Rayleigh's criterion for resolution – resolving power of a telescope – resolving power of a microscope – resolving power of a prism - resolving power of grating.

#### **UNIT IV- Polarisation**

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

# **15 HOURS**

**15 HOURS** 

#### **15 HOURS**

#### **UNIT V- Spectroscopy**

Rotation of molecules – Classification of molecules – Rotation spectra ofdiatomic molecules - I.R. Spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator – Anharmonic oscillator - FTIR spectrometer – Applications –Raman Spectroscopy –Quantum theory of Raman effect – Classical theoryof Raman Effect Raman spectra - applications – FT-Raman spectrometer.

#### **TEXT BOOKS**

- 1. A Text Book of Optics, 23rd Edition, S. Chand & Co, Brijlal and Subramaniam, (2006).
- 2. Modern Physics, 17th edition, S. Chand &Co, (2005), R. Murugesan, (2013).
- 3. Geometrical and Physical Optics, 3rd edition, New Central Book Agency, P.K. Chakrabarti, (2005).

#### **REFERENCE BOOKS**

1. Optics and Spectroscopy, 8th edition, S. Chand & Co, R. Murugesan (2012).

#### WEB RESOURCES

- 1. <u>https://www.khanacademy.org/science/physics/geometric-optics</u>
- 2. <u>http://www.khullakitab.com</u>
- 3. <u>https://academics.uccs.ed</u>u
- 4. uk.directhit.com

#### COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Remember the concept of aberrations in lenses and prisms, wave nature of the light	Remember
CO2	Understand the central concepts and basic formalisms of interference, diffraction, polarisation and basics of spectroscopy	Understand
CO3	Use of tools needed to formulate problems in optics and spectroscopy	Apply
CO4	Derive the dispersive power of a prism using Spectrometer	Apply
C05	Develop the Refractive index of a solid prism and liquid Prism	Apply

#### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	<b>PO3</b>	P04	P05	P06	<b>P07</b>	<b>P08</b>	P09	P010
CO1	L	L	S	М	L	S	М	L	L	М
CO2	L	L	S	М	L	S	М	L	L	М
CO3	L	L	S	М	М	S	М	L	М	М
<b>CO4</b>	L	L	S	L	L	S	М	L	L	М
CO5	L	L	S	М	L	S	L	L	L	М

S- Strong; M-Medium; L-Low

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYS2	OFFICE AUTTOMATION	25	5	-	2

#### OBJECTIVE

The students are able to

- Know the goals and advantages of office automation
- Simplify and support routine office functions, improve communication, increase office productivity and enhance the quality of clerical output.
- Perform office tasks including preparation of reports and correspondence, communications, file maintenance, duplication and distribution of written materials, can be facilitated and improved through word processing and other office automation techniques.

#### **SYLLABUS**

#### UNIT I: MS-Word - I

Opening & Saving files, editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins – Lists – Bulleted and numbered lists, Nested lists, Formatting lists- **Formatting Documents** -Setting Font styles, Font selection- style, size, colour etc - Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins - **Setting Page style** - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes

#### UNIT II: MS-Word – II

**Creating Tables**- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula **-Tools** – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages- **Printing Documents** – Shortcut keys. Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help.

#### **UNIT III: MS-Excel**

Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns Resizing rows and columns, selecting cells, Moving and copying cells, freezing panes -Macros – recording and running. Formatting cells – Formatting toolbar, Dates and times, Auto formatting. Formula and Functions. Linking worksheets - Sorting and Filling, Alternating text and numbers with Auto fill, Auto filling functions. Graphics – Adding clip art, add an image from a file, Charts – Using chart Wizard, Copy a chart to Microsoft Word

#### 7 HOURS

#### **5 HOURS**

#### UNIT IV: MS-Access

Using Access database wizard, pages and projects. Creating Tables – Create a Table in design view. Datasheet Records – Adding, Editing, deleting records, Adding and deleting columns Resizing rows and columns, finding data in a table & replacing, Print a datasheet. Queries - **MS-Access** Forms – Create a form using the wizard, Create a form in Design View. Form Controls. Sub forms-Create a form and sub form at once, Sub form wizard, Drag and drop method. Reports – Using the wizard, Create in Design View, Printing reports. Importing, Exporting, Linking

#### **UNIT V: Open Office Writer**

#### 6 HOURS

Introduction to Writer application – Working with documents – Formatting documents – Creating and formatting tables – Mail merge - **Open Office Calc**: Introduction to Spreadsheet – Creating worksheet & workbook – Managing workbook - Insert functions and formulas – Creating and printing Charts

#### **TEXT BOOKS**

- 1. A First Course in Computers (Based on Windows 8 And MS Office 2013), Sanjay Saxena, Vikas Publishing (2015).
- 2. The Big Basics Book of Microsoft Office, Jennifer fulton, Sherri Kinkoph, and Joe Kraynak, PHI (1997).
- 3. Beginning Open Office 3, Andy Channelle, A Press (2009).

#### **REFERENCE BOOKS**

- 1. Microsoft Office 97 Professional Essentials, Laura Acklen et al, EEE Que E&T, PHI (1998).
- 2. A Conceptual Guide to OpenOffice.Org 2 for Windows and Linux, R. Gabriel Gurley (2007).

#### WEB RESOURCES

- 1. <u>https://www.academia.edu/28779062/OFFICE AUTOMATION Course Code</u> <u>DCSA 1302 Diploma in Computer Science and Application Programme SCH</u> <u>OOL OF SCIENCE AND TECHNOLOGY</u>
- 2. <u>https://www.researchgate.net/publication/327591732 Office Automation Basics</u>
- 3. <u>https://www.youtube.com/watch?v=A0dDEJnVFfI</u>

# COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Acquiring knowledge about file management, creating, editing and storing the documents, making list, formatting the documents	Remember
CO2	Enable executives to electronically build, gather, save, adjust, and communicate workplace information necessary for completing fundamental business (and personal) activities.	Understand
CO3	General Office Skills; File Management, Record Filing	Apply
CO4	Facilitates standardization of office routines	Apply
C05	Providing information retrieval, reducing paperwork, demanding timeliness	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	S	S			L			М	S	S
CO2	S	S	L						М	S
CO3	М	М		М		М			М	S
CO4	S	М					L		S	S
CO5	S	L	М		L				М	S

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYN2	BIOMEDICAL INSTRUMENTATION	25	5	-	2

#### OBJECTIVE

The students are able to

- Give the fundamental ideas on biophysics, bioelectricity, medical equipments, physiotherapy equipment, safety instrumentation.
- Analyse and apply the knowledge of medical equipments and safety instrumentation methods in our day to day life.

#### **SYLLABUS**

#### **UNIT I Biophysics**

Introduction on bio physics - Cell and their structure – Transport of Ions through the cell membrane – Bioelectric potentials – Different system of human body

#### **Unit II Bioelectricity**

Introduction – Components of Biomedical Instrument system– Electro Cardiograph (ECG) – Electromyography (EMG).

#### **Unit III Medical Equipment**

Pacemaker – External and Internal pacemaker – Artificial heart valves– Angiography– Blood pressure measurement-Recording of blood circulation using Doppler Ultra sound method.

#### **Unit IV Physiotherapy Equipment**

Therapeutic Effect of Heat– Ultraviolet and Infrared Therapy– Short wave, micro wave and Ultrasonic diathermy (basic only).

#### **Unit V Safety Instrumentation**

Physiological effects due to current passage – Micro shock - Macro shock-Electrical accidents in hospitals– Hazards in Hospital Radiotherapy.

#### **TEXT BOOKS**

- 1. Biomedical Instrumentation, Dr. M. Arumugam
- 2. Bioinstrumentation, John. G. Webster by R.Murugeshan, S. Chand & Co., New Delhi, (2001).

# 6Hours

# 6Hours

#### **6Hours**

**6Hours** 

**6Hours** 

#### **REFERENCE BOOKS**

- 3. Biological Instrumentation and methodology- P.R. Bajpai
- 4. Basic Radiological physics K. Thyialan

#### WEB RESOURCES

- 3. https://madhavuniversity.edu.in/biomedical-instrumentation.html
- 4. https://en.wikipedia.org/wiki/Bioinstrumentation

#### **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Explain the concept of ECG, EMG, pacemaker, Doppler ultrasound method physiotherapy methods.	Remember
CO2	Apply the knowledge of medical equipments, bioelectric equipments in our day to day life	Apply
CO3	Apply the safety measures of handling the instrumentation.	Apply

### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	L				М		S	
CO2		М		М		L			S	
CO3		S		М		L		М	S	

<b>SEMESTER</b>	IV	

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYP2	Major Practical - II	-	10	140	4

#### OBJECTIVE

The students are able to

- To continue the development of their expertise in applying physical concepts to practical problems and in learning about experimental techniques and advanced equipment
- The experiments complement some of the material covered in the theory courses, but the course can be taken independently.
- Collect data and revise an experimental procedure iteratively and reflectively,
- Evaluate the process and outcomes of an experiment quantitatively and qualitatively,
- Extend the scope of an investigation whether or not results come out as expected,
- Communicate the process and outcomes of an experiment, and
- Conduct an experiment collaboratively and ethically.

#### **SYLLABUS**

#### **Total Hours: 150**

- 1. Young's modulus uniform bending pin and microscope
- 2. Young's modulus uniform bending scale and telescope method
- 3. Torsion pendulum MI and rigidity modulus symmetrical masses

4. Coefficient of Viscosity of a liquid - graduated burette - radius by mercury pellet method.

5. Melde's apparatus - frequency - transverse and longitudinal modes.

- 6. Specific heat capacity of a liquid by cooling verification of Newton's law of cooling.
- 7. Specific heat capacity of a liquid Joule's Calorimeter Half time correction.
- 8. Determination of thickness of a wire and its insulation by Air Wedge.
- 9. Spectrometer grating minimum deviation.
- 10. Potentiometer ammeter calibration.
- 11. Potentiometer Specific resistance.
- 12. M and BH Deflection Magnetometer TAN A and TAN B position.
- 13. Carey Foster's bridge Specific resistance.
- 14. BG Comparison of capacities.
- 15. BG Comparison of EMF's of two cells.
- 16. Half and Full adder.
- 17. Half and Full subtracter.

- 18. Verification of DeMorgan's theorems.
- 19. OPAMP adder and subtracter IC 741
- 20. Four Bit- Binarv counter- Adder and Subtracter.

#### **REFERENCE BOOKS**

- 1. Advanced Practical Physics for Students, B.L. Flint, H.T. Worsnop, Methuen & Co. Ltd., (1957).
- 2. Practical Physics, G. L. Squires, Cambridge University Press, (ISBN 10: 0522770459), 2001.
- 3. Practical Physics, R.K. Sukhla, Anchal Srivatsava, (2009), ISBN 10: 8123417485.

#### WEB RESOURCES

1. https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html

2. https://vlab.amrita.edu/index.php?sub=1&brch=74

3. https://vlab.amrita.edu/index.php?sub=1&brch=192

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
CO1	Able to reminiscent the physical concepts and fundamental laws behind experimental observations and their measurable physical quantities.	Remember
CO2	Comprehend the theory of natural phenomena on the basis of Physics conceptual aspects and the experimental objectives. Able to understand the limitations of the measuring device and its suitability based on the mechanism, error factors and least count, etc.	Understand
CO3	Observed physical concepts to develop technology for the societal upgradations. Interpreting the basis of fundamental laws of physics on day-to-day life events by personal investigations.	Apply
CO4	Able to choose the appropriate measuring tool suitably for the specific experimental observation based on their working mechanism and functionalities.	Apply
CO5	Able to sequencing the experimental procedures and order required for the experimental investigations.	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	М		S	S	L	S	L	L	S	L
CO2			S	S	S	S	М	М	S	
CO3	М		S	S	М	L	L	М	S	L
CO4	S	L	L	S	М	L	L	L	S	М
CO5	-	-	L	L	М	L	L	-	S	М

S- Strong; M-Medium; L-Low

SEMESTER I	/II

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22APY01	ALLIED PHYSICS - I	70	05	-	5

#### **OBJECTIVE**

To understand the concepts of resistance of materials, capacity of conductors, effect of magnetic field due to passage of current, idea about the atom models and energy released in breaking of atom, basic semiconductor diodes, transistor and basic logic gates.

#### **UNIT I: Properties of Matter**

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

#### **UNIT II: Viscosity**

Viscosity – Viscous force – Co-efficient of viscosity – units and dimensions –Poiseuille's formula for co-efficient of viscosity of a liquid – determination of coefficient of viscosity using burette and comparison of Viscosities - Bernoulli's theorem – Statement and proof – Venturimeter – Pitot tube.

#### **UNIT III: HEAT**

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling – Specific heat capacity of a liquid by cooling – thermal conduction – coefficient of thermal conductivity by Lee's disc method.– Black body radiation – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation. (No derivations).

#### **UNIT IV: Thermodynamics**

Zeroth and I Law of thermodynamics – II law of thermodynamics – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – Entropy – Change in entropy in eversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam

#### **UNIT V: Optics**

Interference – conditions for interference maxima and minima – Air wedge – thickness of a thin wire – Newton's rings – determination of wavelength using Newton's rings. Diffraction – Difference between diffraction and interference – Theory of transmission grating – normal incidence – optical activity–Specific rotatory power – determination of specific rotatory power using Laurent's half shade polarimeter.

#### **15 Hours**

**15 Hours** 

**15 Hours** 

#### **15 Hours**

#### **15 Hours**

#### **TEXT BOOKS:**

1. Properties of matter, Brijlal and Subramanyam, Eurasia Publishing co., New Delhi, III Edition, (1983).

2. Element of properties of matter, D.S.Mathur, S.Chand & Company Ltd,New Delhi, 10th Edition, (1976).

3. Heat and Thermodynamics, Brijlal& Subramanyam, S.Chand & Co, 16<sup>th</sup> Edition, (2005)

4. Optics and Spectroscopy, R.Murugeshan, S.Chand and co., New Delhi, 6<sup>th</sup> Edition, (2008).

#### **REFERENCE BOOKS:**

Heat and Thermodynamics, D.S. Mathur, Sultan Chand & Sons, 5th Edition, (2014).
A text book of Optics, Subramanyam and Brijlal, S. Chand and co.. New Delhi, 23nd Edition, (2004).

3. Optics, Sathyaprakash, Ratan Prakashan Mandhir, New Delhi, VIIth Edition, (1990).

#### WEB RESOURCES

- 1. <u>uk.directhit.com</u>
- 2. <u>https://manoa.hawaii.edu</u>
- 3. <u>https://www.ucc.ie/en/physics/wiphysics/resources/heatthermodynamicsre</u><u>sources/</u>
- 4. <u>http://www.freebookcentre.net/Physics/ThermoDynamics-Books.html</u>
- 5. <u>https://www.khanacademy.org/science/physics/geometric-optics</u>
- 6. <u>http://www.khullakitab.com</u>

#### **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Define Poisson's Ratio, Expression for Bending Moment, Determination of Young's, Modulus, Expression for Couple Twist	Remember
C02	Explain Co-efficient of viscosity, Poiseuille's formula, Analyzes different application for Bernoulli's Theorem	Understand
CO3	Define Dulong and Petit's Law- Newton's Law of Cooling, Determination of Thermal conductivity by lee's disc method	Apply
CO4	Determine Zeroth and I, II, III law of Thermo dynamics	Apply
C05	Determination of wave length using Newton's rings, Difference between diffraction and interference, determination of specific rotatory power using Laurent's half shade Polarimeter	Apply

# **MAPPING WITH PROGRAM OUTCOMES-**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	S		S		L		М		L	
CO2	L	М	S	М	М			S	М	S
CO3	М					L	S			М
CO4	S	М		S	S		L	М		
CO5	L	S	М	М		S	S	L	М	

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22APY02	ALLIED PHYSICS - II	70	05	-	5

#### **OBJECTIVE**

To understand the concepts of resistance of materials, capacity of conductors, effect of magnetic field due to passage of current, idea about the atom models and energy released in breaking of atom, basic semiconductor diodes, transistor and basic logic gates.

#### **UNIT I: Current Electricity**

Ohm's law - Law of resistance in series and parallel - Specific resistance capacitors - capacitors in serial and parallel - Kirchoff's laws - Wheatstone's network condition for balance Carey-Foster's bridge - measurement of resistance - measurement of specific resistance -determination of temperature coefficient of resistance -Potentiometer - calibration of Voltmeter.

#### **UNIT II: Electromagnetism**

Electromagnetic Induction - Faraday's laws - Lenz law - Self Inductance - Mutual Inductance - Coefficient of Coupling A.C. Circuits - Mean value - RMS value - Peak value -LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

#### **UNIT III: Atomic and Nuclear Physics**

Bohr's atom model - radius energy - Atomic excitation - Ionization potential -Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect –Binding energy. Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission –X-rays – Production – properties – Derivation of Bragg's law – uses in industrial and medical fields. **UNIT IV: Analog Electronics 15 Hours** 

Semiconductor - PN junction diode - Bridge rectifier - Zener diode - Regulated power supply. Transistor – Working of a transistor – CE Configuration – current gain relationship between  $\alpha$  and  $\beta$  - Transistor Characteristics – CE Configuration only – CE amplifier – Positive feedback – Hartley oscillator – Colpitts oscillator.

#### **UNIT V: Digital Electronics**

Number system – Decimal – Binary – Octal and Hexadecimal system – Binary addition, subtraction and multiplication -Logic gates - OR, AND, NOT, XOR, NAND and NOR gates - truth tables - Half adder and Full adder - Laws and theorems of Boolean's algebra – De Morgan's theorems.

#### **TEXT BOOKS:**

1. Electricity and Magnetism, R. Murugesan, S. chand & co, (2015).

- 2. Modern Physics, R. Murugesan, S. chand & co, (2020).
- 3. Basic Electronics, B.L. Theraja, S. chand & co, (2005).

**15 Hours** 

#### **15 Hours**

#### **15 Hours**

#### **15 Hours**

#### **REFERENCE BOOKS:**

- 1. Brijlal and Subramaniam, Electricity and Magnetism, Palaniyappa publishers, Chennai, (1974).
- 2. Gupta and Kumar, PragatiPrakashan, Hand book of Electronics, Meerut, (1970).
- 3. Modern Digital Electronics, R.P.Jain, Tata McGraw Hill, New Delhi, (1984).

#### WEB RESOURCES

- 1. <u>http://abyss.uoregon.edu > glossary > bohr atom</u>
- 2. <u>https://www.nap.edu > read > chapter</u>
- 3. <u>https://www.allaboutcircuits.com</u>

#### **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	BLOOMS
C01	Acquire knowledge of the fundamental physics underpinning Electricity, Electronics, atomic and nuclear physics	Remember
CO2	They are able to understand the structure of atoms, size of nucleus and all its properties and also Understand various number systems and their importance in digital designing	Understand
CO3	Apply the concepts of Electric circuits.	Apply
CO4	Apply the knowledge to understand the working of amplifiers and multivibrators	Apply
CO5	Apply the principles of Diodes and oscillators	Apply

#### **MAPPING WITH PROGRAM OUTCOMES-**

COs	P01	P02	PO3	P04	P05	P06	P07	P08	P09	P010
C01			S	S		S	S		Μ	
CO2			М	М		М	L		М	
CO3			М			L			S	
<b>CO4</b>				L					L	
CO5									L	

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22AMTP1	Allied Practical -I	-	10	140	3

#### **SEMESTER II**

#### OBJECTIVE

• To develop higher-order thinking competencies through experimental understandings on physical concepts.

• To verify and validate the concepts, principles and hypotheses related to the phenomena of Physics.

• To enhance the cognitive ability of the learner to think on their own towards their skill development.

• Enable them to acquire a job efficiently in diverse fields such as Science and Engineering, Education, Banking, Administrative and Public services, Business etc., through experimental skill.

#### SYLLABUS

Total Hours: 45

- 1. Young's modulus Non uniform bending Scale and Telescope
- 2. Young's modulus Uniform bending Scale and Telescope
- 3. Torsion pendulum Rigidity Modulus of a wire
- 4. Compound pendulum Determination of g.
- 5. Surface tension and Interfacial surface tension Drop weight method
- 6. Specific heat capacity of liquid method of mixtures Half time radiation correction
- 7. Sonometer frequency of AC mains.
- 8. Air Wedge thickness of a thin wire.
- 9. Newton's Rings Radius of curvature of convex lens.
- 10. Potentiometer Calibration of low range Voltmeter
- 11. Potentiometer Calibration of Ammeter
- 12. Figure of merit of a Sensitive Galvanometer.
- 13. Field along the axis of a coil Deflection Magnetometer BH
- 14. Voltage Regulator using IC.
- 15. Verification of basic Logic gates using IC

#### **REFERENCE BOOKS**

1. Advanced Practical Physics for Students – B.L. Flint, H.T. Worsnop, Methuen &

Co. Ltd., (1957).

- 2. Practical Physics, G. L. Squires, Cambridge University Press, (ISBN 10: 0522770459), (2001)..
- 3. Practical Physics, R.K. Sukhla, Anchal Srivatsava, (2009), ISBN 10: 8123417485.

#### WEB RESOURCES

- 1. https://bop-iitk.vlabs.ac.in/basics-ofphysics/List%20of%20experiments.html
- 2. https://vlab.amrita.edu/index.php?sub=1&brch=74
- 3. https://vlab.amrita.edu/index.php?sub=1&brch=192

#### **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Able to reminiscent the physical concepts and fundamental laws behind experimental observations and their measurable physical quantities.	Remember
C02	Comprehend the theory of natural phenomena on the basis of Physics conceptual aspects and the experimental objectives. Able to understand the limitations of the measuring device and its suitability based on the mechanism, error factors and least count, etc.	Understand
CO3	Observed physical concepts to develop technology for the societal upgradations. Interpreting the basis of fundamental laws of physics on day-to-day life events by personal investigations.	Apply
CO4	Able to choose the appropriate measuring tool suitably for the specific experimental observation based on their working mechanism and functionalities.	Apply
CO5	Able to sequencing the experimental procedures and order required for the experimental investigations.	Apply

# **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	М		S	S	L	S	L	L	S	L
CO2			S	S	S	S	М	М	S	
CO3	М		S	S	М	L	L	М	S	L
CO4	S	L	L	S	М	L	L	L	S	М
CO5	-	-	L	L	М	L	L	-	S	М

	JEMES I EN	V	
irse name	Lecture(L)	Tutorial(T)	Practic

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY05	Core Course: Electricity and Electromagnetism	70	05	-	4

CEMECTED V

OBJECTIVE

The students are able to

- Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
- Develop awareness about the properties of static electric and magnetic fields and how they arise, the properties of simple, time-dependent electric and magnetic fields and what kind of physical phenomena they generate
- Use an understanding of calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
- Analyze different problems in electromagnetism using mathematical methods involving vectors, differential and integral calculus, both analytically and numerically
- Have a rudimentary grasp on how experimental equipment related to electricity and magnetism can be use

SYLLABUS

#### **UNIT I: ELECTROSTATICS**

Electric field - Electric field due to a Point Charge – Lines of force of electric field – Gauss's law - Application of Gauss's law: An insulated conductor - Couloumb's theorem-Mechanical force near the surface of a charged conductor

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

#### UNIT II CURRENT ELECTRICITY AND THERMOELECTRICITY 15 HOURS

Carey Foster Bridge - Theory - temperature Coefficient of resistance - Potentiometer – Calibration of ammeter - Calibration of voltmeter – Thermoelectricity - Seebeck effect - laws of thermo e.m.f - intermediate metals, intermediate temperature - determination of thermo emf using potentiometer - Peltier effect – Peltier coefficient – Differences between Peltier effect and Joule effect - S. G. Starling method for Peltier effect - Thomson effect - S. G. Starling method for Peltier effect - Thermo dynamics of thermo couple - Determination of thermoelectric coefficients  $\pi$  and  $\sigma$  - Thermoelectric diagrams – uses of Thermoelectric diagrams

#### **UNIT III: ELECTROMAGNETIC INDUCTION**

Magnetic flux and magnetic induction- Biot Savart law - Magnetic induction due to a straight Conductor carrying current – Magnetic induction at a point on the axis of a circular coil – determination of  $B_H$  using deflection magnetometer - Magnetic induction on the axis of a Solenoid - moving coil Ballistic galvanometer - Damping Correction

Faraday's laws of electromagnetic induction - self-induction - self-inductance of a long solenoid -Determination of absolute capacity of a Condenser - Self - inductance by Anderson's Bridge method - Experimental Determination of mutual inductance - coefficient of coupling - principle, construction, action and working of Ruhmkorff's induction coil.

#### **UNIT IV: TRANSIENT CURRENT**

Growth, decay of current and time constant in a circuit containing resistance and inductance – Growth, decay and time constant of charge in a circuit containing resistance and capacitance - measurement of high resistance by leakage – Growth, decay, time constant of charge in a LCR circuit - condition for the discharge to the oscillatory - frequency of oscillation.

#### **UNIT V: ALTERNATING CURRENTS**

EMF induced in a coil rotating in a magnetic field – Peak value, mean value, form factor for Alternating current - Impedance - peak, average and RMS value of current and voltage - j operator - ac circuit containing resistance and inductance - choke coil - ac circuit containing resistance and capacitance - series and parallel resonance circuits - Q factor – use of operator j in the study of AC circuit - power in an AC circuit containing LCR - Wattless current –Eddy currents- Transformer - construction, theory, energy loss and uses - skin effect – Tesla coil.

#### **TEXT BOOKS**

- 1. R. Murugeshan, Electricity and Magnetism (2008) S Chand & Co, New Delhi
- 2. BrijLal & Subramanyam, Electricity and Magnetism,(2005) 3. Ratan Prakashan Mandir Publishers, Agra
- 3. M.Narayanamurthy & N.Nagarathinam, Electricity & Magnetism, NPC pub., Revised edition.

#### **REFERENCE BOOKS**

- 1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)
- 2. Electricity and Magnetism K.K.Tiwari (S.Chand &Co.)
- 3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Cource, Vol.2 (Mc Grraw-Hill)
- 4. Electricity and Magnetism Tayal (Himalalaya Publishing Co.)
- 5. 5. D.Halliday, R.Resnick and J.Walker, Fundamentals of Physics –Electicity and Magnetism (2011), Wiley India, Pvt Ltd
- 6. David J. Griffith, Introduction to Electrodynamics, (2012) PHI, New Delhi

#### **15 HOURS**

#### **15 HOURS**

#### WEB RESOURCES

1. https://ocw.mit.edu/courses

2. http://www.vidyarthiplus.in/2011/11/engineering-physics-1-ultrasonics.html 3. <u>http://www.ngmc.org/wp-content/uploads/2019/06/B.Sc .-</u> Mathematics Dynamics-17UMA305.pdf

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Understand the basic concepts of Gauss's law, Coulomb's theorem, Seebeck effect, Peltier effect, Thomson effect, Thermoelectric diagrams, Biot Savart's law, Faraday's laws, parameters of AC, eddy current, wattless current	Remember
C02	Application of Gauss's law: An insulated conductor - Principle of a Capacitor - Energy stored in a Capacitor, Differences between Peltier effect and Joule effect - S. G. Starling method for Peltier effect - S. G. Starling method for Peltier effect, construction, action and working of Ruhmkorff's induction coil, condition for the discharge to the oscillatory, Tesla	Understand
C03	Determination of thermoelectric coefficients $\pi$ and $\sigma$ , Applications of thermoelectric diagrams, Magnetic induction at a point on the axis of a circular coil and solenoid problems, self inductance of a long solenoid -Determination of absolute capacity of a Condenser, apply the concepts of electricity	Apply
C04	growth and decay of charge in a circuit containing resistance and capacitance - measurement of high resistance, Transformer - construction, theory, energy loss and uses	Apply
C05	Apply the concepts of electricity, Determination of thermo emf using potentiometer, Determination of absolute capacity of a Condenser, determination of $B_H$ using deflection magnetometer	Evaluate

### MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	S	S	S	S	L		L	S		
CO2	М	S	S	S	М	М				S
CO3	М	М		М	S	М		М		
CO4	М	М			S		L	М	М	
CO5	М	L	S		S		-	-	-	

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY06	ATOMIC PHYSICS	70	05	-	5

#### **SEMESTER V**

#### OBJECTIVE

- To understand the cause behind the Photoelectric effect and relative experimental observations proving the theory of quantum concept.
- To illustrate the concepts of atomic physics used to characterize the matter particle with suitable experimental proof.
- To demonstrate the fundamental behavior of matter particles of various kind based on the conceptual explanations with valid experimental observations.
- To learn the theory of atom model used to explain the functional behavior of atoms and their couplings of different schemes.
- To reveal the concepts of functional activities of atomic particle against the interaction of radiation by exploring the science of spectroscopy.

#### SYLLABUS

#### UNIT - I

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

#### UNIT - II

Discovery and properties of positive rays, Positive ray analysis - Thomson's parabola method - theory - determination of e/m and mass of positive ions - Astons mass spectrograph – Dempster's mass Spectrograph - determination of masses of isotopes - uses of mass spectrographs.

#### UNIT - III

Rutherford experiments – Scattering of  $\alpha$  particle, Theory of alpha scattering – Relation between impact parameter and scattering Rutherford scattering formula - experimental verification Bohr's correspondence principle - evidences in favour of Bohr's theory, Critical potential, atomic excitation - Determination of critical potential, Frank and Hertz's method - Davis and Goucher's method

#### UNIT - IV

 $Sommerfield's\ relativistic\ atom\ model\ -application\ to\ fine\ structure\ of\ H\alpha\ line\ -Description\ of\ vector\ atom\ model\ -\ quantum\ numbers\ associated\ with\ vector\ atom\ model\ -\ coupling\ schemes\ -J.J.\ coupling\ -\ LS.\ coupling\ -\ application\ of\ spatial\ quantisation\ -$
Pauli's exclusion principle, Magnetic dipole moment due to orbital motion of the electron - magnetic dipole due to spin - Stern - Gerlach experiment.

## UNIT - V

Optical spectra - Spectral terms and notations - the selection rule - intensity rule - Lande's g factor - electron configuration - fine structure of Sodium D lines - fine structure of H $\alpha$  line - Zeeman effect - Larmor's theorem - Quantum mechanical explanation of normal Zeeman effect - anomalous Zeeman effect of D1 and D2 lines of sodium – Elementary idea of Paschen – Back effect and Stark effect.

TEXT BOOKS

- 1. Modern Physics (18<sup>th</sup> Edition), R. Murugesan and Sivaprasath Kiruthiga, S. Chand Publishing, 2017.
- 2. Atomic Physics J.B. Rajam, S. Chand & Co. (2004)
- 3. Atomic and Nuclear Physics N. Subramanyam and Brijlal, S. Chand & Co.(2004)

# **REFERENCE BOOKS**

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

# WEB RESOURCES

- 1. <u>https://physics.mit.edu/research-areas/atomic-physics</u>
- 2. <u>https://quantum.lassp.cornell.edu/lecture/atomic\_physics</u>
- 3. <u>https://users.physics.ox.ac.uk/~ewart/Atomic%20Physics%20lecture%20notes%20C%20port.p</u> <u>df</u>
- 4. <u>https://www.ee.ucla.edu/wp-content/uploads/ee/Book-1\_Introductory-Atomic-Physics-and-Quantum-Mechanics.pdf</u>
- 5. <u>https://www2.physics.ox.ac.uk/sites/default/files/2011-10-</u> <u>19/atomic\_physics\_lectures\_1\_8\_09\_pdf\_pdf\_18283.pdf</u>
- 6. <u>https://web.phys.virginia.edu/Announcements/talk-</u> <u>list.asp?GID=atomic\_sem\_committee&PERIOD=history</u>
- 7. <u>https://www.atomic.physics.lu.se/</u>

# COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Recognize the theory of Photoelectric effect and its application as Photoelectric cell.	Remember
C02	Understand the concept of positive rays and Astons mass spectrograph, Dempsters mass Spectrograph.	Understand
C03	Identify the characteristic performance of atomic particles at various experimental conditions by applying the theoretical explanations of various scientists.	Apply
C04	Analyse the scientific causes behind Magnetic dipole moment due to spin and spatial quantization.	Analyze
C05	Formulate and comprehend the basic functions of fibre optic communication networks.	Evaluate

# MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1			S	L	L	S	L	L		
CO2			S	S	М	S	S	S		L
CO3			S	S	М	S	S	S		L
CO4			S	М	S	S	S	S	S	М
CO5	L	L	М	М	М	S	L	L	L	S

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY07	Mathematical Physics	70	05	-	5

# **SEMESTER V**

# OBJECTIVE

The students are able to

- Learn the basic study of matrices with their applications.
- The explaining and understanding of the simultaneous equations.
- The studying of Curve Fitting and Interpolation.
- Understand the basics of approximation, integration and differentiation.
- To enhance problem solving skills.

#### UNIT - I: MATRICES:

Solution of linear equation – Cramer's rule – characteristics matrix and characteristics equation of a matrix – Eigen values and Eigen vectors – Diagonalization matrix – Diagonalization of 3 x 3 symmetric matrices.

#### UNIT - II: BETA AND GAMMA FUNCTIONS:

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

#### UNIT – III CURVE FITTING:

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

#### UNIT - IV: ITERATIVE METHODS:

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

#### UNIT - V: NUMERICAL INTEGRATION:

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

Books for study;

- 1. Introductory methods of numerical analysis S.S. Sastry, Prentice Hall of India, New Delhi 2000 Edition.
- 2. Numerical methods A. Singaravelu, Meenakshi Agency, Chennai (2001)
- 3. Numerical method in Science and Engineering M.K. Venkataraman, PHI New Delhi, 1997.
- 4. Numerical methods B.D. Gupta Konark Publishers Pvt.Ltd,(2003)
- 5. Numerical methods by V.Rajaraman, Prentice-Hall India Pvt.Ltd., (2003)
- **6.** Numerical methods by P. Kandasamy, K. Thilagavathy and K. Gunavathy, S.Chand & Co. (2002).

**Books for References** 

- 1. Mechanics and Mathematical methods, R. Murugesan, S. Chand & Co, New Delhi 1999.
- 2. Numerical Methods, P. Kandasamy, K. Thilagavathy, K. Gunavathi, S. Chand & Co, New Delhi.

Web Site

- 1. <u>http://www.sst.ph.ic.ac.uk/angur/lectures/compphys/compphys.html</u>.
- 2. <u>http://www.library.cornell.edu/nn/</u>

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Learning the concept of Matrices, Beta and Gamma functions	Remember
CO2	Understanding the concept of Curve Fitting.	Understand
CO3	Physics problems involve the use of both basic and numerical methods.	Apply
CO4	Different methods for solving differential and integral equations are available.	Apply
C05	Gets a wide knowledge of numerical methods in computational Physics that can be used to solve many problems.	Evaluate

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	М	L		L	S					М
CO2	М	М		L	S			L		М
CO3	М	М		L	S			L	L	М
<b>CO4</b>	S	М		L	S			М	L	М
CO5	М	М		L	S	L		L	L	М

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM1	ANALOG ELECTRONICS	70	5	-	4

SEMESTER V

#### **OBJECTIVES**

To enable the students to understand the aspects of analog electronics in a lucid and comprehensive manner.

# SYLLABUS

# Unit I: Linear circuit analysis and semiconductor diodes

Constant voltage source - constant current source - Maximum power transfer theorem - Thevenin's theorem - procedure for finding Thevenin Equivalent circuit - PN junction theory - V-I characteristics of a PN junction diode – Half wave rectifier - Bridge rectifier - Efficiency - filters - Shunt capacitor filter – pi filter - Zener diode - equivalent circuit - voltage egulator - LED - V-I characteristics – advantages - applications - photo diode - characteristics - applications.

### **Unit II: Transistor Amplifier**

Transistor - Different modes of operations-CB mode &CE mode - Two port representation of a transistor- h parameter - AC equivalent circuit using h parameters- analysis of amplifiers using h parameters (CE only) - RC coupled amplifier - transformer coupled amplifier - power amplifier -classification of amplifiers - Class A, Class B and Class C - Push pull amplifier – Emitter follower.

# **Unit III: Oscillators and Multivibrator**

Feedback principle -effect negative feedback-and Barkhaussen criterion – Phase shift and Wien Bridge oscillators using transistors –Expression for frequency- Multivibrators-Astable , Monostable and Bistable multi vibrators using transistors - Schmitt trigger.

#### **Unit IV: Special Semiconductor Devices**

Clipping and clamping circuits - Differentiating circuit - Integrating circuit-Field effect Transistor FET-MOSFET- UJT-SCR -characteristics - FET as a VVR-UJT relaxation oscillator-SCR as a switch and rectifier.

#### **Unit V: Operational Amplifier**

Operational Amplifier- characteristics-parameters-applications- Inverting amplifier - Non inverting amplifier - Voltage follower- Adder - Subtractor - Integrator – Differentiator-Solving simultaneous equations-comparator –square wave generator -Wien bridge oscillator -Schmitt trigger.

# **BOOKS FOR STUDY:**

1. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand & Co. (2006).

- 2. Electronics by M. Arul Thalapathi, ComptekPublishers(2005).
- 3. Elements of Electronics by M.K.Bagde and Singh S.P., S. Chand & Co., NewDelhi (1990).
- 4. Applied Electronics by A. Subramanyam National Publishing Co.(1997)
- 5. OP AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI (1994)

# BOOKS FOR REFERENCE:

- 1. Electronic Devices by Mittal.G.K., G.K. Publishers Pvt. Ltd., (1993).
- 2. Basic Electronics by B.L. Theraja, S. Chand & Co., (2008).
- 3. Solid State Electronics by Ambrose and Vincent Devaraj, Meera Publication.
- 4. Applied Electronics by R.S. Sedha, S. Chand & Co.(1990).

## WEB RESOURCES

- 1. https://my.ece.msstate.edu/faculty/winton/CDNuE/SoftCopy/ch9.pdf
- 2. <u>https://pages.uoregon.edu/rayfrey/AnalogNotes.pdf</u>
- 3. <u>https://www.newtondesk.com/analog-electronics-handwritten-study-notes/</u>
- 4. <u>https://www.researchgate.net/publication/264005069 Analog Electronic Circ</u> <u>uits</u>
- 5. <u>http://www.freebookcentre.net/Electronics/Analog-Electronics-Books.html</u>

### COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Illustrate network theorems like Thevenin's theorem, Norton's theorem etc.,	Remember
CO2	Understand the fundamental principles of semiconductors including p-n junctions and zener diode	Understand
CO3	Understand the operation of transistor can amplifier, oscillator and multivibrator	Apply
CO4	To acquire knowledge on transistor and its applications	Apply
CO5	Understand the operation of operational amplifier and its applications	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	S	М	S	S	М	М	S	S	S	М
CO2	S	М	S	S	S	S	М	S	S	S
CO3	S	М	S	S	S	М	S	М	L	М
<b>CO4</b>	S	S	S	S	L	S	S	М	S	S
CO5	М	S	S	М	М	S	S	М	М	L

#### SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM2	FUNDAMENTALS OF PHYSICS –I	70	5	-	4

**OBJECTIVES** 

The students have knowledge

- To recollect the basic concepts of Physics.
- To enlighten the significance and applications of concepts like measurements, states of matters, energy and energy resources, optics, etc.,
- To make aware of the principles and concepts to use in our day-to-day life.

#### SYLLABUS

#### **UNIT I: MEASUREMENTS**

S.I. Units – measurements of length, mass, time and other physical quantities – Dimensional formula for area, volume, density and force – Uses of dimension.

#### **UNIT II: MATTER**

Matter – Solid, Liquid, Gas and Plasma – Application of Plasma – change of state – specific heat capacity – specific latent heat of ice and steam.

#### **UNIT III: ENERGY**

Kinds of energy – Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, atomic and nuclear energy, (Examples) – Conservation of energy.

#### **UNIT IV: RENEWABLE RESOURCES**

Renewable and non - renewable energy - Fossil fuel - coal Oil - Solar - Wind - Biomass - OTEC.

#### **UNIT V: OPTICAL PROPERTY**

Mirror – Laws of reflection – Image formation (Concave and Convex mirror) Lens – Law's of refraction – Image formation (Concave and Convex lens) – Defects of eye and rectification.

# **BOOKS FOR STUDY:**

- 1. Physics for Degree Students C.L.Arora & Dr.P.S.Hemne S. Chand & Co 2010.
- 2. Properties of matter Brijlal Subramanian S. Chand & Co., 2020.

## **BOOKS FOR REFERENCE:**

1. Mechanics - For BSc Pass and Honour Classes – D.S. Mathur –Reprint Edn. 2006 Edition, Kindle Edition- S.Chand & Co.,

2. Properties of matter and Acoustics – R. Murugesan & Kiruthiga Sivaprasath – S. Chand & Co., 2012.

WEB RESOURCES

1. https://easyengineering.net/measurements-and-instrumentation-books-nw/

2. https://kanchiuniv.ac.in/coursematerials/Physics%20book\_Final%20(1).pdf

3. https://www.nrel.gov/docs/fy13osti/54909.pdf

4. https://www.pdfdrive.com/renewable-energy-resources-e14705840.html

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Describe the basic concepts of Physics.	Remember
CO2	Understand the principle behind the topics like measurements, energy, matter, optics etc.,	Understand
CO3	Apply the concept of measurement to measure the substances in our day-to-day life.	Apply
CO4	Investigate the different renewable sources of energy that are useful in our daily life.	Apply
C05	Apply the knowledge of optics to find the types of lenses.	Apply

# **MAPPING WITH PROGRAM OUTCOMES**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	S	М	L	L	-	-	-
CO2	S	М	S	S	L	S	L	S	-	-
CO3	S	S	S	S	-	S	S	L	-	-
CO4	S	М	S	М	-	М	S	L	-	-
CO5	S	М	S	М	М	S	L	-	-	-

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM3	DIGITAL ELECTRONICS	70	5	-	5

#### OBJECTIVE

- To acquire knowledge on number system. •
- To understand the fundamental concepts of logic gates and Boolean algebra.
- To develop skill to build and troubleshoot combinational digital circuits.
- To apply the digital logic levels and to understand the fundamental concepts of counters and registers
- To acquire the basic knowledge of arithmetic building blocks and memories.

#### **SYLLABUS**

#### **UNIT I DIGITAL FUNDAMENTALS**

Number system and codes: Decimal, binary, octal, hex numbers, conversion from one to another - codes: BCD, excess 3, gray codes conversion. - Binary addition subtraction (1's and 2'scompliment method) – multiplication – division.

#### **UNIT II LOGIC GATES**

Basic logic gates - NAND, NOR and EX-OR gates - DeMargan's theorem -Laws and theorems of Boolean algebra - NAND and NOR as Universal Building blocks - SOP and POS - Karnaugh's map - applications.

#### UNIT III COMBINATIONAL CIRCUIT DESIGN

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder -Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, - Decoder – Encoder.

#### **UNIT IV SEQUENTIAL CIRCUITS**

Flip - Flops, RS, clocked SR, JK, D, T, master-slave types - shift registers, ring counters-ripple counters - Up and Down counters- Design of counters - modulus of counters.

#### UNIT V DIGITAL INTEGRATED CIRCUITS AND MEMORY DEVICES 15 HOURS

DAC and ADC: Parameters, Accuracy, Resolution - DAC, variable resistor network, R-2R ladder network types - ADC, counting, continuous, successive approximation, dualslope. Basic memory structure- ROM - PROM - EPROM - EPROM - EAPROM, RAM - Static and dynamic RAM.

#### **15 HOURS**

**15 HOURS** 

**15 HOURS** 

# **15 HOURS**

# **TEXT BOOKS**

- 1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, to 4<sup>th</sup>Edition(1992).
- 2. Digital Fundamentals V. Vijayendran, S.Viswanathan Publishers, Chennai.
- 3. Modern Digital Electronics R.P. Jain, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

# **REFERENCE BOOKS**

1. Micro Electronics - J. Millman, McGraw Hill International Book Company, New Delhi, 1990.

2. Digital Principles and Applications - A.P.Malvino & D.P.Leach, 4/e, Tata McGraw Hill Publishing Co. Ltd.

- 3. Digital Integrated Electronics H. Taub & D. Schilling, McGraw-Hill Book Company.
- 4. Digital Fundamentals T.L. Floyd, Pearson Education, 8/e.
- 5. Digital Electronics W.H. Gothmann, Prentice Hall of India Private Limited, 2/e.

WEB RESOURCES

- 1. https://www.cuemath.com/numbers/number-systems
- 2. https://www.tutorialspoint.com/computer\_logical\_organization/logic\_gates.htm
- 3. https://learn.adafruit.com/combinational-logic?view

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Gain knowledge between different types of number systems, and their conversions.	Remember
CO2	Design various logic gates and simplify Boolean equations.	Understand
CO3	Design various flip flops, shift registers and determining outputs.	Apply
CO4	Design different types of counters for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.	Understand
C05	Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters and to apply the memory devices in different types of digital circuits for real world application.	Apply

# **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
CO1	S			S					М	
CO2	S	S	L	М					S	
CO3		S		М					S	
CO4	S			S	L				S	
CO5			М	S	L	L			S	L

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM4	FUNDAMENTALS OF PHYSICS -II	70	5	-	4

# SEMESTER V

**OBJECTIVES** 

The students have knowledge

- To recollect the basic concepts of Physics.
- To enlighten the significance and applications of concepts like Electric current, DC sources, AC and measurement of electric power, simple electric circuits etc.,
- To make aware of the principles and concepts to use in our day-to-day life.

#### SYLLABUS

#### **UNIT 1: ELECTRIC CURRENT**

Electric current- voltage and resistance- Ohm's law- Kirchhoff's law - Resistances in series and in parallel.

#### **UNIT 2: DC SOURCE**

DC Source – Primary cells – Leclanche and Daniel cell – Secondary cells – Lead Acid Accumulator – DC generator.

#### **UNIT 3: ALTERNATING CURRENT**

Alternating current generation by hydro, thermal and atomic power stations–RMS value – Peak value (Quantitative) – AC generator – no derivation.

#### **UNIT 4: MEASUREMENT OF ELECTRIC POWER**

Measurement of Electric power by Wattmeter- simple calculations- Induction coil-Wattless current- Power factor.

#### **UNIT 5: ELECTRICAL CIRCUITS**

Simple electrical circuits – resistor, capacitor and inductor connected to AC source (independently) – Relationship between emf and current in each case. Diode – Bridge Rectifier.

#### **BOOKS FOR STUDY:**

- **1.** Electricity and Magnetism R. Murugesan S. Chand & Co 2004.
- 2. Physics for Degree Students C.L.Arora & Dr.P.S.Hemne S. Chand & Co 2010.

# **BOOKS FOR REFERENCE:**

1. A textbook in Electrical Technology in SI units Vol 1, B.L. Theraja and A.K. Theraja, S. Chand & Co., 2007.

2. Chapters On Electricity – An Introductory Text – Book for students in College, Samuel Sheldon, Read Books, 2008.

WEB RESOURCES

- 1. https://Textbook-Electrical-Technology-Theraja-B-L/dp/8122924413
- 2. <u>https://textbook-electrical-technology/p/itmdwy75edze2gdt</u>
- 3. <u>https://Electrical-Appliances-Complete-Maintenance</u> <u>Domestic/dp/1859601049</u>
- 4. <u>https://www.academia.edu/30578229/ELECTRICAL\_MACHINES\_AND\_APPLIA</u> <u>NCES\_TAMIL\_NADU\_TEXTBOOK\_CORPORATION</u>
- 5. <u>https://library.si.edu/digital-library/book/electricalappli00heap</u>

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Learning the concept of electric current, DC source, AC and its measurements etc.,	Remember
CO2	Understanding the simple electrical circuits.	Understand
CO3	Apply the knowledge of electric current and its properties in their day-to-day life.	Apply
CO4	Apply the concept of measuring the electric power in their daily life.	Apply
C05	Construct simple electrical circuits for domestic applications.	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	PO3	P04	P05	P06	P07	P08	P09	P010
CO1	S	М	S	S	М	М	-	-	S	-
CO2	S	М	S	S	-	М	-	-	S	-
CO3	S	М	S	S	L	L	-	-	S	-
CO4	S	М	S	S	М	L	-	-	S	-
CO5	S	М	S	S	-	L	-	-	S	-

## SEMESTER V

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYS3	FUNDAMENTALS OF COMPUTER	25	5	-	2

OBJECTIVE

The students are able to

- Understand basics of computer
- ➢ Working with OS
- Know Organization and operation of a computer processor
- Learn Primary and secondary memory, peripheral devices
- Explain the representation of data and information in computer systems

### **SYLLABUS**

### **UNIT I: Introduction to computer**

Introduction - Types of computer - Characteristics of computers- What computers can do – What computers Can't do – classification of digital Number System – Binary, octal, decimal, Hexa decimal.

#### **UNIT II: Input and Output devices**

Input device - Types of Input devices- Output device- Types of Output devices - CPU-Memory unit- Auxillary storage devices.

# **UNIT III: Operating Systems**

Operating system - Types of Operating Systems - Computer networks - Overview of a network - Types of networks - Network topologies - Network protocols - Network Archives.

#### **UNIT IV: Internet**

Introduction - What's special about internet - internet access - internet basics - The World Wide Web - Web browsers - Searching the web - Internet chat- Social Network (Twitter, Facebook, Instagram, Viber and WhatsApp).

# **UNIT V: E-Mail**

Electronic mail – use of E-mail – How E-mail works – E-mail names addresses – Mailing basics - Email ethics - Spanning - E-mail advantages and disadvantages - tips for effectives Email use - smileys useful - Email services.

#### **6 HOURS**

**6 HOURS** 

**6 HOURS** 

**6 HOURS** 

# **6 HOURS**

# **TEXT BOOKS**

1.Fundamentals of Computer Architecture and Design,Ahmet Bindal, 2nd Edition, Springer (2019).

2.Fundamentals of Computer Organization and Architecture,Abd-El-Barr M., El-Rewini H.,Wiley (2005).

3.Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer (2003).

4.Internet Infrastructure: Networking, Web Services, and Cloud Computing, Richard Fox, Wei Hao, CRC Press (2018).

# **REFERENCE BOOKS**

1.Fundamentals of Computer Vision, Wesley E. Snyder, Hairong Qi, Cambridge University Press (2017).

2.Fundamentals OF Computers, E Balagurusamy, MC GRAW HILL INDIA, 2009.

3.Computer Systems. Digital Design, Fundamentals of Computer Architecture and Assembly Language, Ata Elahi, Springer (2018)

4.The Internet Book: Everything You Need to Know about Computer Networking and How the Internet Works, Douglas Comer,CRC Press(2018).

# WEB RESOURCES

https://www.javatpoint.com/computer-fundamentals-tutorial https://libguides.humboldt.edu/openedu/cs https://www.khanacademy.org/computing https://nios.ac.in/media/documents/vocational/CLS/Certificate Course in Library Science english/

# M4\_PDF/M4L1.pdf

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Acquiring knowledge about Computer generation and types of computers.	Remember
CO2	Input and Output device used in computers	Understand
CO3	Different types of Operating systems	Apply
CO4	Internet applications	Apply
C05	Mail services	Apply

# **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S			L			М	S	S
CO2	S	S	L						М	S
CO3	М	М		М		М			М	S
CO4	S	М					L		S	S
CO5	S	L	М		L				М	S

S- Strong; M-Medium; L-Low

# TASK

1. Assignment on Generation of Computer

2. Group Discussion on Input and Output devices

3. Making students to send Email and browse using web browser.

# TASK

1.Assignment on  $\alpha$  ,  $\beta$  and  $\Upsilon$  decay

2.Group Discussion on structure of Nuclei

3. Making stuents to make shell model of an atom.

4.Construction of nuclear reactor model.

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY08	NUCLEAR PHYSICS	70	05	-	5

## SEMESTER VI

#### OBJECTIVE

- To acquire knowledge on static properties of nuclei and its stability.
- To understand the background of various nuclear models.
- To know about different modes of decay and interaction of nuclearradiations with matter

#### SYLLABUS

### **UNIT I Properties and structure of Nuclei**

General properties of nucleus- binding energy – BE/A curvesignificance - proton electron theory- proton neutron theory -Nuclear forces– Meson theory of nuclear forces – Yukava Potential- Nuclear models: liquid drop model - nuclear shell model.

#### **UNIT II Radio Activity**

Fundamentals of radio activity-Laws of successive disintegration - transient - and secular equilibria –theory of  $\alpha$ ,  $\beta$  and  $\Upsilon$  decay- properties of alpha, beta and gamma rays - neutrino and its properties-electron capture. - Nuclear isomers- Mossbauer effect - applications- Radio carbon dating- radio isotopes – uses

#### **UNIT III Nuclear Reactions**

Kinematics of nuclear reaction-Nuclear fission – Nuclear fusion – Nuclear reactor-uses - atom bomb - hydrogen bomb-fusion reactor – plasma confinement – artificial transmutation-Q value of nuclear reaction-types of nuterreaction

#### UNIT IV Nuclear Detectors and Particle Accelerators 7 Hours

Neutron sources and properties-Detectors-G.M.Counter-scintillation counter- bubble chamber-Wilson cloud chamber-Accelerators-cyclotron-synchrocyclotron-betatron-synchrotrons

#### UNIT V Cosmic Rays and Elementary Particles 7 Hours

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

#### **6 Hours**

**6** Hours

# 7 Hours

Elementary particles-introduction-particles and antiparticles-antimatter-the fundamental interaction-elementary particle quantum numbers-conservation laws and symmetry-the quark model.

# **TEXT BOOKS**

- 1. Atomic and Nuclear Physics by N. Subrahmanyam and Brijlal, S Chand & Co.,New Delhi (1996).
- 2. Nuclear Physics by D.C.Tayal, Himalaya Publishing House (2006) .
- 3. Nuclear Physics by R.C.Sharma, K.Nath& Co., Meerut (2000)
- 4. Nuclear Physics by Irving Kaplan, Narosa Publishing house, New Delhi.
- 5. Modern Physics by R. Murugesan, S.Chand& Co., (2005)

# **REFERENCE BOOKS**

- 1. Nuclear Physics by R.R.Roy and B.P.Nigam, New Age International (P) Ltd., NewDelhi(1997).
- 2. Fundamentals of Elementary Particle Physics by Longo, McGraw-Hill.
- 3. Nuclei and Particles by Serge., W.A. Benjamin, USA
- 4. Elements of Nuclear Physics by ML Pandya and RPS Yadav, KedarnathRam Nath,Meerut.

# WEB RESOURCES

- 1. https://www.britannica.com/science/radioactivity
- 2. https://www.britannica.com/science/nuclear-reaction
- 3. https://www.britannica.com/science/cosmic-ray
- 4. https://www.physics.upenn.edu/~pgl/e27/E27.pdf

# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understanding on the basics of nuclear physics that treats atomic nucleias self-bound many-body quantum systems.	Understand
CO2	Explain the different forms of radioactivity and account for their occurrence.	Knowledge
CO3	Basic interaction between fundamental particles	Understand
CO4	Classify the nuclear detectors and particle accelerators	Understand
CO5	Explain the properties of elementary particles and Cosmic Rays.	Knowledge

# MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10
CO1	S	S	S	М		L	S			
CO2	S	S	S	L		S	S		L	
CO3	S	S	S	М		S	S			L
CO4	S	S	S	М		L	S		L	
CO5	S	S	S	М		М	S			L

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY09	Quantum Mechanics and Relativity	70	05	-	5

# **SEMESTER VI**

#### OBJECTIVE

Scope of the syllabus is structured based on specific aims and objectives as follows:

- To explore the significance of wave mechanics rather than the conventional methods.
- To enlighten the students' knowledge with the theoretical and experimental observations of quantum mechanics and its advances.
- To familiarize the significance of Schrodinger's wave equations and to apply it's the concepts to explore the behavioral performance of hydrogen atom, rigid rotator, etc.
- To literate the relativistic mechanics of students the fundamentals of and its correlations with Quantum Mechanical theory.

#### **SYLLABUS**

#### Unit - I - Dual Nature of Matter

Inadequacy of classical mechanics - Matter waves - Phase and group velocity - Wave packet - Expressions for de-Broglie wavelength - Davisson and Germer's experiment - G.P. Thomson experiment – Heisenberg's uncertainty principle – Determination of position with  $\gamma$  – ray microscope – Diffraction of a beam of electrons by a slit - Non existence of electrons in the nucleus.

#### **Unit - II - Wave Mechanics**

Schrodinger's wave equation – Derivation of Time dependent and Time independent forms – Physical significance of wave function – Normalised and Orthogonal wave functions - Basic postulates of Quantum mechanics – Operator formalism – Eigen values and Eigen functions – Linear operators – Adjoint operators – Expectation values.

#### **Unit - III - Applications of Schroedinger's Equations**

Application of Shcroedinger equation – Free particle solution of Schroedinger's equation – Particle in a box (One dimensional approach) – Determination of normalised wave function – Barrier penetration problem – Square well in three dimensions – Linear harmonic oscillator – Harmonic oscillator wave functions.

#### **Unit - IV - Three Dimensional Problems**

Three-dimensional Schrödinger's wave equation –Hydrogen atom – Wave equation for the Motion of an electron – Separation of variables– Radial wave equation and it's solutions – Polar wave equation and its solution – Azimuthal wave equation and its solution – Rigid rotator – Separation of variables – Rotational energy levels and eigen functions-Commutations relations of orbital angular momentum

## Unit – V – Relativity

Frame of reference – Galilean transformation – Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation – Length contraction – Time dilation – Relativity of simultaneity – Addition of velocities – Variation of mass with velocity – Mass – Energy relation – Minkowsky's four dimensional space – Time continuum – Four vectors – Elementary ideas of general theory of relativity.

#### **TEXT BOOKS**

- 1. Modern Physics (18<sup>th</sup> Edition), R. Murugesan and Sivaprasath Kiruthiga, S. Chand Publishing, 2017.
- 2. Advanced Quantum Mechanics, Satya Prakash, Kedar Nath Ram Nath Publications
- 3. A text book of Quantum Mechanics, Mathews & Venkatesan, Tata McGraw Hill, New Delhi

4. Relativity and Quantum Mechanics, P.K. Palanisamy, Sitech Pub., Kumbakonam.

#### **REFERENCE BOOKS**

- 1. Quantum Mechanics, Leonard Schiff, McGraw Hill Book Company, Inc., New York.
- 2. Quantum Mechanics, Ghatak & Loganatha, Mcmillan Publications,
- 3. Perspective of Modern Physics, Beiser, McGraw Hill Co. New York.

#### WEB RESOURCES

- 1. <u>https://physicscourses.colorado.edu/EducationIssues/Quantum/materials.html#ln</u>
- 2. <u>https://www.nist.gov/pml/nist-technical-note-1297/nist-tn-1297-2-classification-components-uncertainty</u>
- 3. https://www.physicsforums.com/insights/the-7-basic-rules-of-quantum-mechanics/
- 4. <u>https://www.merlot.org/merlot/viewMaterial.htm?id=74545</u>
- 5. <u>https://openstax.org/books/college-physics/pages/1-2-physical-quantities-and-units#0</u>

#### **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Learning the inadequacy of Newtonian mechanics in exploring the functional characteristics of matter	Remember
CO2	Approaching the science of matter particles with the theory of dual nature.	Analyse
CO3	Exploring the science behind the experimental observations revealing the wave nature of matter	Understand
CO4	Applying the Schroedinger wave equation to solve the characteristic formulations of the matter	Apply
C05	Understanding the fundamental theory of relativity behind the length contraction and time dilation	Understand

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01		L	S	S	L	М	S	L		
CO2	L	L	S	S	L	S	S	S		L
CO3		L	S	S	L	S	S	S		
C04			S	S	S	S	S	S	L	
CO5	L		L	S	S	М	S	L		L

# MAPPING WITH PROGRAM OUTCOMES

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPY10	SOLID STATE PHYSICS	70	5	-	5

# **SEMESTER VI**

#### **OBJECTIVES**

- 1. To understand the different types of bonding in solids
- 2. To understand the magnetic and dielectric properties of crystalline structures.
- **3.** To acquire knowledge on the basics of magnetic phenomena on materials and various types of magnetization.
- 4. To know the properties of superconducting materials

### SYLLABUS

#### **UNIT I: Bonding in Solids**

Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding - Bond energy of sodium chloride molecule - variation of inter atomic force with inter atomic spacing -cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal - evaluation of Madelung constant for sodium chloride.

# **UNIT II: Crystal Structure and Crystal Diffraction**

Crystal Lattice -Primitive and unit cell-seven classes of crystal-Bravais Lattice- Miller Indices-Structure of crystals- Simple cubic, Face centered cubic, Body centered cubic and Hexagonal close packed structure -Sodium Chrloride, Zinc Blende and Diamond Structures.

Crystal Diffraction – Bragg's law-Experimental methods-Laue method, powder method and rotating crystal method-Reciprocal lattice- Intensity and structure factor.

#### **UNIT III: Magnetic Properties**

Spontaneous Magnetization – Weiss Theory – Temperature dependence of Magnetization -classical Theory of Diamagnetism – Weiss theory of Paramagnetism – Ferromagnetic domains – Bloch wall – Basic ideas of antiferromagnetism – Ferrimagnetisms – Ferrites in computer Memories.

# **UNIT IV: Band theory of solids & Dielectric Properties**

Band theory of solids –classification of insulators, Semiconductors, conductors – intrinsic and extrinsic semiconductor – Carrier concentration for electron - Barrier Potential Calculation – Rectifier Equation Dielectrics - Polarization Types– frequency and temperature effects on polarization-dielectric loss-Clausius Mosotti relationdetermination of dielectric constants.

# **UNIT V: Super Conductivity**

Introduction - General Properties of Superconductors - effect of magnetic field -Meissner effect - effect of current - thermal properties - entropy - specific heat -energy gap - isotope effect - London equations - AC & DC Josephson effects - applications - Type–I and Type–II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High TC superconductors.

# **BOOKS FOR STUDY:**

1. Materials Science by M. Arumugam, Anuradha Agencies Publishers.,(2002).

2. Solid State Physics by R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003).

3. Introduction to Solid State Physics by Kittel, Willey Eastern Ltd. (2003).

4. Materials Science and Engineering by V. Raghavan, Prentice Hall of India Private Limited, New Delhi(2004).

# **BOOKS FOR REFERENCE:**

1. Solid State Physics by S.O. Pillai, New Age International (P) Ltd., (2002).

2. Solid State Physics by A. J. Dekker, Macmillan India(1985).

3. Solid State Physics by HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).

# WEB RESOURCES

- 1. <u>https://dokument.pub/solid-state-physics-by-m-a-wahab-z-liborg-flipbook-pdf.html</u>
- 2. <u>https://vdoc.pub/documents/solid-state-physics-structure-and-properties-of-</u> <u>materials-76ds384snhb0</u>
- 3. <u>https://www-</u> <u>thphys.physics.ox.ac.uk/people/SteveSimon/condmat2012/LectureNotes2012.pd</u> <u>f</u>
- 4. <u>http://www.issp.ac.ru/ebooks/books/open/Introduction%20to%20Modern%20</u> <u>Solid%20State%20Phys.pdf</u>
- 5. <u>https://indico.cern.ch/event/812393/contributions/4296144/attachments/2386</u> <u>663/3886585/Materials%20Physics-ASP22-23-07-22-lecture%20I.pdf</u>

# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Summarize how crystalline materials are studied using diffraction	Remember
CO2	Able to discuss about the interatomic forces and bonds between solids	Understand
CO3	Explain the behavior of solids with their magnetic properties	Apply
CO4	Understand the concept of electric polarization and its types.	Understand
C05	Analyze the importance of superconducting materials in engineering applications.	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	М	S	S	S	М	S	S	S	М
CO2	S	S	М	М	S	S	М	S	S	S
CO3	S	М	S	S	S	М	S	S	L	М
CO4	S	S	S	S	L	S	S	М	S	S
CO5	М	S	S	М	М	S	S	М	М	L

**15 HOURS** 

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM5	Core Course: Microprocessor fundamentals 8085	70	05	-	4

#### **SEMESTER VI**

OBJECTIVE

The students are able to

- Outline the history of computing devices.
- Describe the architecture of 8085 microprocessors.
- Impart the knowledge about the instruction set.
- Understand the basic idea about the data transfer, arithmetic and logical operations and its applications.
- Develop programs for microprocessor 8085 array operations.

# **SYLLABUS**

# **UNIT I: INTRODUCTION TO MICROPROCESSOR**

Terms related to microprocessor (microprocessor, microcomputer, Bit, Byte, MSB, LSB, Nibble, Word, Instruction, Bus, Mnemonic, Program, Machine language, Assembly language) - Functional block diagram of microcomputer - Development of microprocessor – Pin configuration of microprocessor of 8085- address and data bus - control bus – Demultiplexing address/data bus – Generation of control and status signals – Interrupts

# UNIT II ARCHITECHTURE OF 8085 MICROPROCESSOR 15 HOURS

Architecture of microprocessor 8085 – Word length –registers – ALU – Accumulator – stack pointer – program counter – Flags - internal data bus –Instruction format – Mnemonics – Addressing modes of 8085 - Classification of instructions of 8085 based on their length with examples

# UNIT III: INSTRUCTION SET OF MICROPROCESSOR 8085 15 HOURS

Instruction set of 8085 – Classification of instruction set based on the function with examples – Data transfer operations – Arithmetic operations – Logical operations – Branching operations – Machine control operations – Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer.

# UNIT IV: ASSEMBLY LANGUAGE PROGRAMS-I 15 HOURS

Assembly language programs: 8-bit addition - 8-bit subtraction - 8-bit multiplication – 8-bit division – Square and Square root of a number – Code conversion

## UNIT V: ASSEMBLY LANGUAGE PROGRAMS-II

# **15 HOURS**

Transferring a block of data Assembly language programs: Arranging numbers in ascending and descending order (Bubble sort method) – Finding greatest and smallest number in an array – Sum of N numbers – Generating Fibonacci series.

# **TEXT BOOKS**

- 1. Microprocessor Architecture programming and application with 8085/8080A. by Ramesh.S.Gaonkar, Wiley Eastern Ltd.(1992).
- 2. Fundamental of microprocessor 8085 by V. Vijayendran, S.Viswanathan Publishers, Chennai(2003).
- 3. Fundamentals of Microprocessors and microcomputers by B.Ram -Dhanpat RAI publication.

# **REFERENCE BOOKS**

- 1. Introduction to microprocessor by AdityaMathur Tata Mc.Graw Hill Publishing Company Ltd.(1987).
- 2. Microprocessor and digital system by Dougles V. Hall 2nd Edition -McGraw Hill Company(1983).

# WEB RESOURCES

- 1. https://ocw.mit.edu/courses
- 2. http://www.vidyarthiplus.in/2011/11/engineering-physics-1-ultrasonics.html
- 3. <u>http://www.ngmc.org/wp-content/uploads/2019/06/B.Sc</u> .-
- Mathematics Dynamics-17UMA305.pdf

# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Recall basic concepts of digital fundamentals to Microprocessor based personal computer system,	Remember
CO2	Understand the basic architecture of 8085	Understand
CO3	Impart the knowledge about the instruction set	Apply
CO4	Identify the addressing mode of an instruction.	Apply
CO5	Design and implement programs on 8085 microprocessor.	Evaluate

# **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	S	S	L		L	S		
CO2	М	S	S	S	М	М				S
CO3	М	М		М	S	М		М		
CO4	М	М			S		L	М	М	
C05	М	L	S		S		-	-	-	

SEM	ESTE	R VI

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYM6	MEDICAL PHYSICS	70	5	-	4

#### OBJECTIVE

- To understand the basics about the biological systems in our body, theirbehavior, and the diagnostic devices.
- To provide comprehensive knowledge of Transducers.
- To interpret the concepts of some medical equipment's.

### **SYLLABUS**

#### **UNIT I Anatomical Terminology**

Basic Anatomical Terminology- Standard anatomical position, Planes, Familiarity with terms like - Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal, Distal. - Forces on and in the Body - Physics of the Skeleton Heat and Cold in Medicine- Energy work and Power of the Body.

#### **UNIT II Applications of Physics in medicine 15 HOURS**

Pressure system of the body- Physics of Cardiovascular system-Electricity within the Body – Applications of Electricity and Magnetism in Medicine. Sound in medicine- Physics of the Ear and Hearing- Light in medicine- Physics of eyes and vision.

## **UNIT III Transducers**

Transducers- performance of characteristics of transducer- static and dynamic active transducers – (a) magnetic induction type (b) piezoelectric type (c) photovoltaic type (d) thermoelectric type. Passive transducer- (a) resistive type – effect and sensitivity of the bridge (b) capacitive transducer (c) linear variable differential transducer (LVDT).

#### **UNIT IV Medical Equipment's**

X-rays- Production of X-rays- X-ray spectra- continues spectra and characteristic spectra- Coolidge tube- Electro Cardio Graph (ECG) - Block diagram- ECG Leads- Unipolar and bipolar-ECG recording set up

# **UNIT V Recording Instruments**

Electro Encephalo Graph (EEG) - origin- Block diagram- Electro Myogragh (EMG) – Block diagram- EMG recorder- Computer Tomography (CT) principle-Block diagram of CT scanner.

#### **15 HOURS**

**15 HOURS** 

**15 HOURS** 

**15 HOURS** 

**TEXT BOOKS** 

- 1. Medical Physics –John R. Cameron and James G.Skofronick, 1978, JohnWilly & Sons.
- 2. Bio medical instrumentation E D II, Dr M. Arumugam, AnuradhaAgencies 1997.

# **REFERENCE BOOKS**

- 1. Attix FH (1986) An introduction to radiological physics and radiation dosimetry, Wiley.
- Bortfeld T, Biirkelbach J, Boesecke R, SchlegelW(1990a) Methods of image reconstruction from projections applied to conformation radiotherapy. Phys Med Biol 35(10):1423–1434.

# WEB RESOURCES

- 1. <u>https://byjus.com/physics/transducer</u>
- 2. enhub.com/en/library/anatomy/anatomical-terminology
- 3. https://www.nibib.nih.gov/science-education/science-topics/computed-tomography-ct

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Understand the concepts of Anatomical Terminology	Understand
CO2	Describe the various applications of physics in medicine	Understand
CO3	Point out the concepts and working principle of Transducers.	Analyze
CO4	To learn the internal architecture and working principle of various instruments used in medical field	Remember
C05	Employ independent learning strategies to self- evaluate and update professional knowledge of innovations in medical radiation physics	Apply

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	S							
CO2		S	S							
CO3		S								
CO4	S	S								
CO5	S	S	S							

	Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
	22UPYM7	Communication Electronics	70	5	-	5
(	OBJECTIVE	S				

**SEMESTER VI** 

The students have knowlede of

1. To acquire knowledge about modulation and demodulation techniques

2. To understand the concepts and techniques involved in communication by TV

3. To learn the working principles of RADAR and basic ideas about Optoelectronic devices like photoconductive cell, solar cell, phototransistor LCD, LED.

4. To study the Fibre optics communication and characterization data transmission circuits

#### **SYLLABUS**

UNIT - I Modulation

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

# UNIT - II Demodulation

Demodulation - definition - Diode detection of AM signals - FM detection - Foster Seely discriminator. Radio receivers - straight receivers - TRF receivers - super heterodyne receivers - Block diagram - explanation of each stage - FM receivers - Block diagram.

#### UNIT - III Television

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

#### UNIT - IV RADAR

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

# **14 HOURS**

**15 HOURS** 

#### **14 HOURS**

# **18 HOURS**

Unit V: Fibre Optic Communication

# **14 HOURS**

Basic Fibre Optic System - Advantages of Fibre Optic System - Propagation of light through fibre -Numerical aperture - Acceptance angle - Losses and distortion in optical fibres - Basic fibre Optical communication and links - Special applications.

**BOOKS FOR STUDY** 

- 1. Hand book of Electronics Gupta & Kumar, Pragati Prakhasan (2005)
- 2. Electronics Communication Systems Kennedy and Davis, TMH
- 3. Basic Electronics Mithal
- 4. Principle of Electronics Metha

**REFERENCE BOOKS** 

- 1. Communication Electronics, Frenzel
- 2. Electronic Communication System, Wayne Tomasi

# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Definition of Modulation, Demodulation, principle of radar, Basic Fibre Optic System	Remember
C02	Employ the concept of TV transmitter and receiver - Colour TV - generation R, G, B signals, TV transmitting antennas - dipole panel - TV receiving antenna - Yagi antenna.	Understand
CO3	Develop skills for solar cell concepts and photoconductive cell, phototransistor.	Understand
CO4	The ability to apply knowledge in Radio receivers, FM detection, FM receivers and the problems in electronic circuits, communication systems, Radar equation	Apply
C05	Formulate and apply fundamental and function of fibre optics communication systems.	Evaluate

# MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	S	S				М	S	L
CO2	S	S	S	S	S			М	S	L
CO3	S	S	S	S				М	S	L
CO4	S	S	S	S				М	S	L
CO5	S	S	S	S				М	S	L

S- Strong; M-Medium; L-Low

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYS4	ELECTRICAL APPLIANCES	25	5	-	2

SEMESTER VI

The students have knowlede of

**OBJECTIVES** 

- To understand the students about the necessity of heating and welding equipment's and its way of handling the equipment in dealing the issues wherein the conventional methods incapable.
- To enlighten the students the significance and applications of Transformers and mode of connection of three Phase transformers.
- To make aware of the students about the principles of domestic applications.

# SYLLABUS

### **UNIT - I Heating**

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

#### **UNIT - II Welding**

Resistance welding - Electric arc welding - DC and AC welding equipment - Energy storage welding - Industrial heating and welding.

# **UNIT - III Principles of transformers**

Principle of operation - Constructional details - Core type, Shell type - classification of transformers - EMF equation - Transformer ratios - Losses in a transformer, Efficiency of a transformer, Condition for maximum efficiency, Variation of efficiency with power factor – All day efficiency - Auto transformer - Principle – Applications.

# **UNIT - IV Applications of transformers**

Three phase Transformer - Connections - Star - Star, Star - delta, Delta- Star, Delta-Delta - Parallel operation of transformers (Single phase and Three phase) Load sharing of transformer (definition only) - Cooling of transformers - Protective devices and accessories.

# **UNIT - V Domestic appliances**

Construction and working principle of home appliances- fan - Wet grinder - Mixie -Water heater - Electric iron - Refrigerator - Microwave oven.

**5** Hours

**6 Hours** 

# 7 Hours

# 7 Hours

# **5 Hours**

# **BOOKS FOR STUDY:**

- 1. A text book in Electric power, P.L. Soni, P.V. Gupta & V.S. Bhatnagar
- **2.** Utilisation of Electrical Energy, E.O. Taylor, Orient Longman, Art & Science of Utilisation of Electrical Energy,
- 3. H. Partas, M/s. Dhanpat Raji & Sons, New Delhi.
- **4.** A Course in Electrical Power, J.B. Gupta, M/s. B.D. Jaataris & Sons.

# **BOOKS FOR REFERENCE:**

- 1. A text book in Electrical Technology, B.L. Teraja, S. Chand & Co., New Delhi
- 2. A text book in Electrical Technology, A.K. Teraja, S. Chand & Co., New Delhi
- 3. Alternating current machines, Philip Kermp
- 4. Performance and design of A.C. Machines, M.G. Say, ELBS Edn.
- 5. Theory of alternating current Machinery, Alexander Langsdort.

# WEB RESOURCES

- 6. <u>https://Textbook-Electrical-Technology-Theraja-B-L/dp/8122924413</u>
- 7. <u>https://textbook-electrical-technology/p/itmdwy75edze2gdt</u>
- 8. <u>https://Electrical-Appliances-Complete-Maintenance-</u> <u>Domestic/dp/1859601049</u>
- 9. https://www.academia.edu/30578229/ELECTRICAL\_MACHINES\_AND\_APPLIA NCES\_TAMIL\_NADU\_TEXTBOOK\_CORPORATION
- 10. https://library.si.edu/digital-library/book/electricalappli00heap
# **COURSE OUTCOMES**

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

S. NO.	COURSE OUTCOME	<b>BLOOMS VERB</b>
C01	Learning the concept of Modes of heat transfer and Applications of heat transfer.	Remember
C02	Understanding the classification of transformers and Core type, Shell type.	Understand
CO3	Apply the knowledge for solving the DC and AC welding equipment	Apply
C04	Apply the concept of Cooling of transformers and Protective devices and accessories.	Apply
C05	Construction the home appliances such as fan, Wet grinder and Mixie.	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	S	S	М	S	М	S	S	S	М	S
CO2	S	S	S	М	М	S	L	М	S	S
CO3	S	S	М	S	S	М	М	L	S	М
C04	М	S	S	S	L	М	S	S	L	М
CO5	S	М	S	М	М	S	S	М	М	S

S- Strong; M-Medium; L-Low

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYP3	Major Practical - III	-	10	140	4

### **SEMESTER V & VI**

#### OBJECTIVE

The students are able to

- To continue the development of their expertise in applying physical concepts to practical problems and in learning about experimental techniques and advanced equipment
- The experiments complement some of the material covered in the theory courses, but the course can be taken independently.
- Collect data and revise an experimental procedure iteratively and reflectively,
- Evaluate the process and outcomes of an experiment quantitatively and qualitatively,
- Extend the scope of an investigation whether or not results come out as expected,
- Communicate the process and outcomes of an experiment, and
- Conduct an experiment collaboratively and ethically.

#### SYLLABUS

### **Total Hours: 150**

- 1. Cantilever Young's modulus mirror and Telescope (Depression method).
- 2. Static torsion Rigidity modulus.
- 3. Coefficient of Viscosity ungraduated burette radius by mercury pellet Methods
- 4. Lee's disc thermal Conductivity of a bad conductor and emissivity.
- 6. Newton's rings refractive index of a lens.
- 7. Spectrometer i i' curve.
- 8. Spectrometer Small angled Prism.
- 9. Potentiometer Calibration of high range Voltmeter.
- 10. Deflection magnetometer m and BH Tan C position.
- 11. Principle of Multimeter.

12. Microprocessor 8085: 8-bit addition and subtraction using immediate and register addressing modes.

13 Program for shifting of 8-bit number left and right using RAL and RAR respectively by 1 bit in 8085 microprocessor.

- 13. Verification of Kirchoff's laws
- 14. Determination of thermo e.m.f direct method MG
- 15. Bridge rectifier with four diodes.

- 16. FET Characteristics
- 17. UJT Characteristics
- 18. SCR Characteristics
- 19. Hartley Oscillator
- 20. Colpitt's Oscillator

#### **REFERENCE BOOKS**

- 1. Advanced Practical Physics for Students, B.L. Flint, H.T. Worsnop, Methuen & Co. Ltd., (1957).
- 2. Practical Physics, G. L. Squires, Cambridge University Press, (ISBN 10: 0522770459), 2001.
- 3. Practical Physics, R.K. Sukhla, Anchal Srivatsava, (2009), ISBN 10: 8123417485.

#### WEB RESOURCES

- 1. https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html
- <u>2. https://vlab.amrita.edu/index.php?sub=1&brch=74</u>
- 3. https://vlab.amrita.edu/index.php?sub=1&brch=192

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
C01	Able to reminiscent the physical concepts and fundamental laws behind experimental observations and their measurable physical quantities.	Remember
C02	Comprehend the theory of natural phenomena on the basis of Physics conceptual aspects and the experimental objectives. Able to understand the limitations of the measuring device and its suitability based on the mechanism, error factors and least count, etc.	Understand
CO3	Observed physical concepts to develop technology for the societal upgradations. Interpreting the basis of fundamental laws of physics on day-to-day life events by personal investigations.	Apply
CO4	Able to choose the appropriate measuring tool suitably for the specific experimental observation based on their working mechanism and functionalities.	Apply
C05	Able to sequencing the experimental procedures and order required for the experimental investigations.	Apply

WAPPI		HPRU	GRAW C		VIES					
COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	М		S	S	L	S	L	L	S	L
CO2			S	S	S	S	М	М	S	
CO3	М		S	S	М	L	L	М	S	L
CO4	S	L	L	S	М	L	L	L	S	М
CO5	-	-	L	L	М	L	L	-	S	М

S- Strong; M-Medium; L-Low

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UPYP4	Major Practical - IV	-	10	140	4

### SEMESTER V & VI

### OBJECTIVE

The students are able to

- To continue the development of their expertise in applying physical concepts to practical problems and in learning about experimental techniques and advanced equipment
- The experiments complement some of the material covered in the theory courses, but the course can be taken independently.
- Collect data and revise an experimental procedure iteratively and reflectively,
- Evaluate the process and outcomes of an experiment quantitatively and qualitatively,
- Extend the scope of an investigation whether or not results come out as expected,
- Communicate the process and outcomes of an experiment, and
- Conduct an experiment collaboratively and ethically.

#### SYLLABUS

### **Total Hours: 150**

- 1. Koenig's method non uniform bending.
- 2. Koenig's method uniform bending.
- 3. Cantilever dynamic method.
- 4. Bifilar pendulum Parallel threads.
- 5. Determination of Energy Band gap of a semiconductor.
- 6. Newton's rings Refractive index of a liquid.
- 7. Spectrometer dispersive power of a grating.
- 8. Spectrometer Cauchy's constant.
- 9. Potentiometer emf of a thermocouple.
- 10. Field along the axis of a coil vibration magnetometer.
- 11. Carey Foster's bridge temperature Coefficient of resistance.
- 12. Program for shifting of 8 bit number left and right using RLC and RRC respectively by 1 bit in 8085 microprocessor.

13. Microprocessor 8085: 8 bit addition and subtraction using direct and register indirect addressing modes.

- 14. Construction of multiplug switch boards
- 15. Astable multivibrator using 555 timer.

- 16. Monostable multivibrator using 555 timer.
- 17. Bistable multivibrator using 555 timer.
- 18. Flip flops using gates.
- 19. RC coupled amplifier single stage.
- 20. Operational amplifier integrator and differentiator.

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- 2. Practical Physics, G. L. Squires, Cambridge University Press, (ISBN 10: 0522770459), 2001.
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### WEB RESOURCES

- <u>1. https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html</u>
- 2. https://vlab.amrita.edu/index.php?sub=1&brch=74
- 3. https://vlab.amrita.edu/index.php?sub=1&brch=192

# COURSE OUTCOMES

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

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CO3	Observed physical concepts to develop technology for the societal upgradations. Interpreting the basis of fundamental laws of physics on day-to-day life events by personal investigations.	Apply
CO4	Able to choose the appropriate measuring tool suitably for the specific experimental observation based on their working mechanism and functionalities.	Apply
C05	Able to sequencing the experimental procedures and order required for the experimental investigations.	Apply

## **MAPPING WITH PROGRAM OUTCOMES**

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
C01	М		S	S	L	S	L	L	S	L
CO2			S	S	S	S	М	М	S	
CO3	М		S	S	М	L	L	М	S	L
CO4	S	L	L	S	М	L	L	L	S	М
CO5	-	-	L	L	М	L	L	-	S	М

S- Strong; M-Medium; L-Low