DEPARTMENT OF PHYSICS
H.H. THE RAJAH'S COLLEGE(AUTO)
PUDUKKOTTAI - 622 001

COURSE STRUCTURE
AND
SYLLABI
FOR UG PROGRAMME

CHOICE BASED CREDIT SYSTEM
(2021 - 2022 ONWARDS)

H.H. THE RAJAH'S COLLEGE (AUTONOMOUS), PUDUKKOTTAI

B. Sc. Physics Programme Pattern - CBCS - 2021 2022 Onwards

Sl. No.	Sem	Paper	Hrs /week	Credit	Exam hrs.	Marks		
						Internal	External	Total
1	I	Part- I - Tamil- I/ Hindi - I	6	3	3	25	75	100
2	I	Part- II - English - I	6	3	3	25	75	100
3	I	Major Paper - I -Gravitation, Properties of Matter and Sound	6	6	3	25	75	100
	I	Major Paper - II (Practical- I)*	3					
4	I	Allied Paper - I - Mathematics - I	5	5	3	25	75	100
5	I	Environmental Science	2	2	3	25	75	100
	I	Soft Skill - I * -	2					
6	II	Part- I - Tamil- II/ Hindi - II	6	3	3	25	75	100
7	II	Part- II - English - II	6	3	3	25	75	100
8	II	Major Paper - II (Practical- I)*	3	3	3	40	60	100
9	II	Major Paper - III - Mechanics and Relativity	6	5	3	25	75	100
10	II	Allied Paper - II - Mathematics - II	5	5	3	25	75	100
11	II	Value Education	2	2	3	25	75	100
12	II	Soft Skill - I * -	2	4	3	25	75	100
13	III	Part- I - Tamil- III/ Hindi - III	6	3	3	25	75	100
14	III	Part- II - English - III	6	3	3	25	75	100
15	III	Major Paper - IV - Thermal and Statistical Physics	5	5	3	25	75	100
	III	Major Paper - V(Practical- II)*	3					
	III	Allied Paper - III* - Chemistry	3					
	III	Allied Paper - IV(Chemistry Practical)*	3					
16	III	Non- Major Elective - I - Chemistry in everyday life	4	2	3	25	75	100
17	IV	Part- I - Tamil- IV/ Hindi - IV	6	3	3	25	75	100
18	IV	Part- II - English - IV	6	3	3	25	75	100
19	IV	Major Paper - V(Practical- II)*	3	3	3	40	60	100
20	IV	Major Paper - VI - Optics and Spectroscopy	5	5	3	25	75	100
21	IV	Allied Paper - III* - Chemistry	3	5	3	25	75	100
22	IV	Allied Paper - IV(Chemistry Practical)*	3	5	3	40	60	100
23	IV	Soft Skill -II -	4	4	3	25	75	100
24	V	Major Paper - VII - Electricity, Magnetism and Electromagnetism	4	4	3	25	75	100
25	V	Major Paper - VIII - Atomic Physics	4	4	3	25	75	100
26	V	Major Paper -IX - Analog Electronics	5	5	3	25	75	100
	V	Major Paper - X(Practical- III)*	3					
	V	Major Paper - XI(Practical- IV)*	3					
27	V	Elective Paper - I - Laser Physics and Fibre optics	5	5	3	25	75	100
28	V	Non- Major Elective - II - Astronomy	2	2	3	25	75	100

29	V	Soft Skill - III -	4	4	3	25	75	100
30	V	Major Paper - X(Practical- III)*	3	3	3	40	60	100
31	V	Major Paper - XI(Practical- IV)*	3	3	3	40	60	100
32	VI	Major Paper - XII - Solid State Physics	5	5	3	25	75	100
33	VI	Major Paper - XIII - Digital Electronics and Micro Procesor	5	5	3	25	75	100
34	VI	Major Paper - XIV - Wave Mechanics and Nuclear Physics	4	4	3	25	75	100
35	VI	Elective Paper - II - C Programming application in Physics	5	5	3	25	75	100
36	VI	Elective Paper - III - Communication Systems	4	4	3	25	75	100
37	VI	Gender Studies	1	1	3	25	75	100
		Extension Activities		1				
			180	140				3700

*** Exams will be held at the end of even semester**

V	Alternative Non Major Elective- I- - Energy Physics
V	Alternative Major Elective- I- Electrical Appliances
VI	Alternative Major Elective- II- Electric Generators and Electric Motors
VI	Alternative Major Elective- II- Mobile Communication
VI	Alternative Major Elective- III- Biomedical Instrumentation
Vi	Alternative Major Elective- III- Nano Physics
VI	Alternative Major Elective- III- Plasma Physics
VI	Value added course - I Astrophysics
VI	Value added course - II Basic Meteorology

B.SC. PHYSICS 2021- 2022 onwards

Program Educational Objectives(PEOs)

On obtaining an undergraduate degree the students will be able to,	
PEO1	Have strong foundation in basic sciences,mathematics and computational platforms.
PEO2	Acquire professional and ethical attitude,develop communicative skills,teamwork spirit,multidisciplinary approach and an ability to relate and solve scientific technical issues.
PEO3	Enter into higher studies leading to post- graduate and research degrees.
PEO4	Apply and advance the knowledge and skills acquired to become a competent professional in their chosen field.
PEO5	Serve the society with scientific advancement and to actively take part in building knowledge - based society.
PEO6	Comprehence ,analyze,design and create novel products and solutions for the real life problems through good scientific and technical knowledge.
PEO7	Become and enterepreneur who can make and sell scientific products in the market.
PEO8	Engross in life- long learning to keep themselves abreast of new developments and to face to global challenges.

B.SC. PHYSICS 2021- 2022 onwards

Program Specific Outcomes(PSOs)

After the successful completion B.Sc.,Physics program,the students are expected to,	
PSO1	Realize the role of physics in day to day life.
PSO2	Communicate explicitly and exchange ideas with regard to the impacts of various components of physics on environment and society
PSO3	Expertise in various domains of physics.
PSO4	Design and develop the skills towards the futuristic needs of the industry/society utilizing both theoretical and practical knowledge acquired in basic physics
PSO5	Identify and access the diverse applications of physics using mathematical concepts enriching towards career opportunities.

Program Outcomes (Pos)

On successful completion of the B.Sc Physics program,the students will be able to,	
PO1	Understand the basic concepts and significance of various physical phenomena.
PO2	Transforms ideas into action i.e lab to land.
PO3	Acquire a wide range problem solving skills,both analytical and computational and to apply them.
PO4	Develop an independent and self- disciplined specialized learning in tune with the changing socio- technological scenario.
PO5	Get motivated to pursue higher education and research activities in physics to find professional level employment get motivated to pursue higher education and research activities in physics to find professional level employment.
PO6	Identify,analyze and formulate novel ideas to yields, substantial results in the fields of research utilizing the principle of physics.
PO7	Develop creative thinking and innovative tools.

CC01 : GRAVITATION, PROPERTIES OF MATTER AND SOUND

SUB.CODE: 21UPH1

Course objectives:
The main objectives of this course are

1. To study the basic principles of gravitation.
2. To understand the elastic properties and modulus of the materials.
3. To learn the basic concepts of viscosity.
4. To gain knowledge about surface tension and osmosis.
5. To analyze the properties of Sound and ultrasonics.

UNIT - I: GRAVITATION

Newton's law of gravitation - Kepler's law of planetary motion - Newton's law from Kepler's law - Determination of G by Boy's method - Gravitational field - Gravitational potential at a point due to a body of mass (m) - Gravitational potential and field at a point outside and inside a solid sphere - Acceleration due to gravity (g) - Value of g at the poles and at the equator - Variation of g with altitude, Depth and rotation of the earth.

UNIT - II: ELASTICITY

Introduction - Stress, Strain - Hookes law - Moduli of elasticity - Relation between them- Poisson's ratio - Bending of beams - Expression for bending moment - Measurement of Young's modulus - Uniform and non-uniform bending - Cantilever depression and oscillation - Koenig's method Torsion - Torsion of a cylinder - Torque per unit twist of solid and hollow cylinders - Work done in twisting a wire - Rigidity modulus by Torsion pendulum - Searle's method of finding elastic constants of a short wire.

UNIT - III: VISCOSITY

Viscosity - Co-efficient of viscosity - Streamline and turbulent flow - Critical velocity - Reynolds's number and its significance - Poiseuille's formula and its corrections - Determination of Viscosity: Variable pressure head, Ostwald's viscometer - Variation of viscosity with temperature and pressure - Difference between friction and lubrication - Co-efficient of viscosity of highly viscousliquid by Searle's viscometer - Meyer's modification of Poiseuille's formula for gases - Rankine'smethod.

UNIT - IV: SURFACE TENSION AND OSMOSIS

Surface tension - Excess of pressure inside a curved liquid surface : Spherical and Cylindrical Drops and bubbles - Jaeger's method - Angle of contact - Variation of surface tension with temperature - Surface tension and interfacial surface tension by method of drops - Quincke's method for mercury (with and without angle of contact).

Osmosis - Laws of Osmotic pressure - Experimental determination of Osmotic pressure - Osmosis and vapour pressure of a solution

UNIT - V: SOUND

Intensity of sound - Decibel - Intensity level - Phon- Laws of transverse vibrations - Melde's string method - Acoustics of buildings - Sabine's formula - Doppler effect - Derivation for change in frequency - Lissajous figures - Uses - Ultrasonics - Properties - Production by Piezoelectric and Magnetostriction methods - Applications.

Expected course outcomes:
After completion of this course students will be able to

1. Analyze the principles behind the gravitational forces and its variation at different places.
2. Explore the basic concepts of elastic properties of materials and importance of elasticity in beams.
3. The viscous properties of fluids provides knowledge in industrial product development.
4. Explain the different molecular forces existing in liquids.
5. Acquire the idea of applications of ultrasonic waves in diverse fields.

Books for study and reference:

1. D.S. Mathur - Properties of Matter, S. Chand & Co, Delhi , (2010).
2. R. Murugesan - Properties of matter, S. Chand & Co, Delhi, (2012).
3. H.R. Gulati, Fundamentals of General properties of matter, S. Chand &Co. Pvt. Ltd, (2012)
4. Brijal & Subramanyam - Properties of matter, S. Chand & Co, (2005).
5. C.L. Arora- Waves and oscillations, S. Chand & Co, 2002.
6. Brijlal & Subramanyam , Text Book of Sound. S. Chand & Co, 2004..
7. R.L. Saihgal, A Text Book of Sound, S. Chand & Co. Pvt. Ltd, New Delhi,1979.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc

1. https://www.physicstutoronline.co.uk/alevelphysicsnotes/
2. https://latestcontents.com/bsc- physics- mechanics- notes/
3. www.khanacademy.org/science/physics/elasticity/surface tension
4. https://sites.google.com/brown.edu/lecture- demonstrations/home?authuser=0

Mapping with programme outcomes 21UPH1							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	3	9	9	9
CO2	9	9	9	3	9	9	9
CO3	9	9	9	1	9	3	9
CO4	9	9	9	9	1	9	9
CO5	9	9	3	9	9	9	1
Total	45	45	33	25	37	39	37
Weightage	**4.76**	**4.76**	**4.51**	**3.36**	**5.34**	**5.31**	**5.26**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC02 : PRACTICAL - I

SUB.CODE: 21UPH2P

Course objectives:
The main objectives of this course are

1. To develop the experimental skills in Mechanics and Properties of matter.
2. To knowledge about the experiments based on Electricity and Magnetism.
3. To motivate the students to apply the experimental techniques in Optics.
4. To develop the experimental techniques in Sound.
5. To motivate the students to apply the experimental techniques in Transmission of heat.

LIST OF EXPERIMENTS
Any 15 Experiments

1. Determination of g and k using compound pendulum.
2. Determination of Young's modulus by non-uniform bending(pin and microscope).
3. Determination of Young's modulus by uniform bending(scale and telescope).
4. Determination of Rigidity modulus by static torsion apparatus.
5. Determination of surface tension and interfacial surface tension by drop weight method.
6. Verification of laws of transverse vibrations in a stretched string using sonometer.
7. Determination of frequency of the vibrator by Melde's string apparatus.
8. Determination of viscosity by graduated burrette method.
9. Determination of specific heat capacity of liquid by Newton's cooling method.
10. Determination of thermal conductivity of a bad conductor by Lee's disc method.
11. Determination of focal length of a long focus convex lens by auxiliary lens method.
12. Determination of focal length of a concave lens by auxiliary lens method.
13. Determination of temperature coefficient of resistance using Post Office box.
14. Determination of internal resistance of a cell using potentiometer.
15. Determination of refractive index of the material of the prism by spectrometer.
16. Study of V- I characteristics of a junction diode and zener diode.
17. Determination of thickness of a wire by forming Air wedge.

Expected course outcomes:
After completion of this course students will be able to

1. Analyze the concepts of Viscosity,Surface tension,Youngs modulus of different substances
2. Realize principles and applications of spectrometer and other optical instrument
3. Realize principles and applications of Potentiometer,Sonameter,Magnetometer
4. Acquire the knowledge of the characteristics of an PN junction diode and Zener diode
5. Realize principles and applications of Transmission of heat

Books for study and reference:

1. A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
2. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)
3. P.R. Sasi Kumar, Practical Physics –, PHI. Learning Pvt .Ltd (2012).
4. S. P.Singh, Advanced Practical Physics, Pragathi Prakasam.1st edision (2007).
5. Practical Physics – St. Joseph College, Trichy. 2002

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
2. https://nptel.ac.in/courses/115/105/115105110/
3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8- rZn_LgLofRX7n8z4tHYK

Mapping with programme outcomes 21UPH2P							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	3	9	3	1	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	1	9	9	1
Total	45	45	39	31	39	37	37
Weightage	**4.76**	**4.76**	**5.33**	**4.17**	**5.63**	**5.03**	**5.26**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC03 : MECHANICS AND RELATIVITY

SUB.CODE: 21UPH3

Course objectives:
The main objectives of this course are

1.To have a knowledge in the field of statics.
2.To improve the knowledge about impulsive force and impact of interacting bodies.
3.To learn the basics of moment of inertia and centre of mass
4.To understand the concepts of hydrostatics and hydrodynamics.
5.To learn the basic principles of classical mechanics.

UNIT - I: STATICS

Centre of gravity: Center of Gravity of a solid hemisphere, hollow hemisphere, tetrahedron and solid cone - Friction: Types of friction - Laws of friction - Coefficient of friction - Angle of friction - Cone of friction - Equilibrium of a body on a rough inclined plane by external forces - Applications of friction: friction clutch.

UNIT - II: PROJECTILE, IMPULSE AND IMPACT

Projectile - Path of a projectile - Range on an inclined plane - Impulse - Impulsive force - Collision Elastic and inelastic collision - Impact - Laws of impact - Impact of a smooth sphere on a horizontal plane - Direct and Oblique impact between two smooth spheres - Loss of Kinetic energy - Motion of two interacting bodies - Reduced mass.

UNIT - III: DYNAMICS OF RIGID BODIES

Centre of Mass - Velocity and acceleration centre of mass - Moment of Inertia - Linear momentum - Angular momentum - Conservation of linear and angular momentum - Relation between torque and angular momentum - Kinetic energy of rotating body - Theory of Compound Pendulum - Determination of g and k.

UNIT - IV: HYDROSTATICS AND HYDRODYNAMICS

Pressure and thrust - Centre of Pressure - Centre of Pressure of a rectangular lamina andTriangular lamina - Atmospheric Pressure - Variation of atmospheric pressure with altitude height of homogeneous atmosphere - Equation of Continuity - Energy of liquid in motion - Euler's equation - Bernoulli's theorem - Pitot tube -Venturimeter.

UNIT- V: LAGRANGIAN MECHANICS AND RELATIVITY

Mechanics of a system of particles - Constraints - Generalized co- ordinates - Principle of virtual work - D'Alembert's principle - Lagrange's equation from D'Alembert's principle - Application to Simple pendulum - Linear harmonic oscillator - Atwood's machine.

Special Theory of Relativity - Inertial frames - Galilean and Lorentz transformations - Length contraction and time dilation - Addition of Velocities - Variation of mass with velocity - Mass energy equivalence

Course outcomes:
After completion of this course students will be able to

1. Know the concepts of gravity, friction and its applications.
2. Apply the knowledge of impulse and collisions in day to day life.
3. Find out the usage of rigid body dynamics in terms of moment of inertia, momentum and energy in several of types of bodies.
4. Understand the concept of hydrostatics and hydrodynamics in day to day applications such as pumps and hydraulic press.
5. Explore the understanding of mechanics and theory of relativity in various fields.

Books for study and reference:

1. R. Murugeshan, Mechanics and Mathematical Physics, S.Chand& Company Ltd., New Delhi , Third Revised Edition (2008).
2. M. Narayanamurthi and N. Nagarathinam, Dynamics, the National Publishing Company, 8th Edition(2008).
3. Narayanamurthi andM. Nagarathnam, Statics, Hydrostatics and Hydrodynamics, The National Publishing Company, 8th Edition(2008).
4. D.S. Mathur, Mechanics, S.Chand& Company Ltd., New Delhi, Third Revised Edition (2000).
5. R.Murugeshan, Modern Physics, S. Chand & Co.(2006).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Static and dynamic measurement https://youtu.be/DFdTRPUwK_I
2. Pressure measurement https://youtu.be/sHmjE21Fp9w
3. https://youtu.be/As5kzxkyT24 4 NPTEL https://www.youtube.com/watch?v=3eYmFjHnQjY&list=PLbRMhDVUMngcoKrA4sHzvbN
4. https: //www.askiitians.com/revision- notes/physics/special- theory- of- relativity

Mapping with programme outcomes 21UPH3							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	1	9	1
CO2	9	9	9	3	9	9	9
CO3	9	9	9	9	9	1	9
CO4	9	9	9	9	9	9	9
CO5	9	9	3	9	9	9	3
Total	45	45	39	39	37	37	31
Weightage	**4.76**	**4.76**	**5.33**	**5.24**	**5.34**	**5.03**	**4.40**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC04: THERMAL AND STATISTICAL PHYSICS

SUB.CODE: 21UPH4

Course objectives:
The main objectives of this course are to

1. Explain basic thermodynamic properties and units.
2. Explain various types of transmission of heat and the measurement of various constants. related to it tools for the arrangement of microscopic particles.
3. Teaches first and second laws of thermodynamics, perfect gas law, properties of real gases and the energy equation for closed and open systems.
4. Know the concept of entropy and Maxwell's thermodynamic equations.
5. Know the different forms of distribution of sub atomic particles in the system using statistical methods.

UNIT - I: SPECIFIC HEAT

Specific heat capacity of solid and liquids - Dulong and Pettit's law - Variation of specific heat andatomic heat with temperature - Newton's laws of cooling - Specific heat capacity of liquids by cooling - Two specific heat capacity of gases - Mayer's relation - Determination of specific heat at constant volume by Joly's method and specific heat capacity at constant pressure by Reynold's method.

UNIT - II: TRANSMISSION OF HEAT

Stefan's law - Coefficient of thermal conductivity - Forbe's method to find K - Lee's method for bad conductors - Thermal conductivity of glass - Heat flow through a compound wall - Statement and derivation of Stefan's law - Determination of Stefan's constant (Laboratory method) - Distribution of energy in the spectrum of a black body - Derivation of Planck's law Conduction- Derivation of Newton's law from Stefan's law.

UNIT - III: NATURE OF HEAT AND THERMODYNAMICS

Intermolecular force of attraction - Porous plug - Theory and experiment - Joule-Kelvin effect - Temperature of inversion - Zeroth of thermodynamics - Heat and work - A path function - Isothermal,Adiabatic,Isochoric and Isobaric process - First law thermodynamics - Specific heat capacity of gas - Derivation of adiabatic gas equation - Efficiency of a Carnot's engine - Carnot's theorem - Clausius inequality - Concept of Entropy and Second law - Change in entropy for an reversible & irreversible process.

UNIT - IV: MAXWELL'S THERMO DYNAMICAL RELATIONS

T- S diagram - Entropy of a perfect gas - Derivation of Maxwell's thermodynamics relations - Applications - TdS equations - Clapeyron's latent heat equation - Specific heat relation - Thermodynamic Potentials: Internal energy - Helmholtz function - Gibb's function - Enthalpy.

UNIT - V: STATISTICAL THERMODYNAMICS

Phase space - Statistical equilibrium - Microstates and macro states - Maxwell - Boltzmann distribution law - Ensembles (Concept only) - Quantum statistics - Fermi Dirac distribution law - Applications to electron gas - Bose Einstein distribution law - Application to photon gas - Radiation laws(Planck, Rayleigh Jeans and Wien) .

Course outcomes:
After successful completion of the course the student is expected to

1. Become familiar with various thermodynamic process and work done in the process.
2. Derive expressions and find experimental verifications for the laws studied.
3. Have a clear understanding about the working of a carnot engine, and knowledge of calculating change in entropy for various process.
4. Realize the importance of Thermo dynamical functions and applications of Maxwell's relations.
5. Familiarize about statistical distribution and have basic Ideas about Maxwell - Boltzman,Bose - Einstein and Fermi Dirac Statistics and their applications.

Books for study and reference:

1. Heat and thermodynamics - Brijilal and Subramaiyan, S.Chand & co., New Delhi (2001)
2. Brijlaland Subramaniyam, Heat and Thermodynamics & Statistical physics, S.Chand & Co. (2015).
3. Heat and Thermodynamics - Mathur, D.S.Sultan Chand & Sons, New Delhi (2014).
4. A.Text book of Heat and Thermodynamics -Rajam.J.B and Arora, C.L., S.Chand & co Ltd , New Delhi (1983).
5. . R. Murugeshan and Kiruthiga Sivaprasath, Thermal physics, S. Chand & Co, New Delhi , (2008)
6. A. B. Gupta and H. P.Roy, Thermal Physics, Books &Allied Ltd; 3rd Revised edition edition (2010)
7. M. Narayanamoorthy and N. Nagarathinam, *Heat*, National publishing Co,Chennai, Eight edition, 1987.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.askiitians.com/revision- notes/physics/heat- transfer/
2. https://www.askiitians.com/revision- notes/physics/kinetic- theory- of- gases/
3. https://www.askiitians.com/revision- notes/physics/heat- phenomena/
4 .https://www.askiitians.com/revision- notes/physics/thermodynamics/

Mapping with programme outcomes 21UPH4							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	1	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	1	9	1	1
CO4	9	9	9	9	3	9	9
CO5	9	9	3	9	9	9	3
Total	45	45	33	37	31	37	31
Weightage	**4.76**	**4.76**	**4.51**	**4.97**	**4.47**	**5.03**	**4.40**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC05: PRACTICAL - II

SUB.CODE: 21UPH5P

Course objectives:
The main objectives of this course are

1. To develop the experimental skills in Mechanics and Properties of matter.
2. To gain knowledge about the experiments based on Electricity and Magnetism.
3. To motivate the students to apply the experimental techniques in Spectrometer.
4. To develop the experimental techniques in Potentiometer and Magnetometer.
5. To motivate the students to apply the experimental techniques in Transmission of heat.

LIST OF EXPERIMENTS
Any 15 Experiments

1. Determination of Young's modulus by cantilever depression (scale and telescope).
2. Determination of Rigidity modulus using Torsion pendulum.
3. Determination of surface tension by capillary rise method.
4. Determination of viscosity by Searle's viscometer.
5. Determination of viscosity by Stoke's method.
6. Determination of specific heat capacity of liquid by Joule's calorimeter method.
7. Determination of refractive index of the material of the prism by i- d curve method using spectrometer.
8. Determination of wavelength of prominent lines of mercury spectrum by Normal incidence method using spectrometer and grating.
9. Determination of specific resistance given material ofwire using CareyFoster bridge.
10. Determinaiton of figure of merit of a mirror galvanometer.
11. Determination of emf of a thermocouple by direct deflection method using mirror galvanometer.
12. Determination of temperature coefficient of resistance using Potentiometer.
13. Determination of M and H using deflection and vibration magnetometers.
14. Determination of impedance and power factor of a coil.
15. Construction of full wave rectifier with filter.
16. Determination of emissive power of a surface by spherical calorimeter.
17. Laser- Wavelength determination.

Expected course outcomes:
After completion of this course students will be able to

1. Analyze the concepts of Viscosity,Surface tension,Youngs modulus of different substances .
2. Realize principles and applications of spectrometer and other optical instruments.
3. Realize principles and applications of Potentiometer,and Magnetometer.
4. Realize principles and applications of Full wave rectifier with filter.
5. Realize principles and applications of Transmission of heat.

Books for study and reference:

1. A text book of Practical Physics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,Sultan Chand&Sons(2017).
2. Practical Physics and Electronics,C.C.Ouseph,U.J.Rao,V.Vijayendran, S.Viswanathan Publishers(2007)
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011
4. Dr. S. Somasundaram, Practical Physics, Apsara publications,Tiruchirapalli, 2012.
5. S. P.Singh, Advanced Practical Physics, Volume 2,Pragati Prakashan(Meerut) (2004).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
2. https://nptel.ac.in/courses/115/105/115105110/
3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8- rZn_LgLofRX7n8z4tHYK

Mapping with programme outcomes 21UPH5P							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	9	9	1
CO2	9	9	3	9	9	9	9
CO3	9	9	9	3	1	1	9
CO4	9	9	9	9	9	9	9
CO5	9	9	3	9	1	9	3
Total	45	45	33	39	29	37	31
Weightage	**4.76**	**4.76**	**4.51**	**5.24**	**4.18**	**5.03**	**4.40**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC06: OPTICS AND SPECTROSCOPY

SUB.CODE: 21UPH6

Course objectives:
The main objectives of this course are

1. To familiarize the fundamental laws concerning aberrations.
2. To provide basic concepts and applications of phenomena like interference and their related optical techniques.
3. To give a hands- on experience to study diffraction of different optical phenomena by performing experiments.
4. To understand the phenomena of polarization.
5. To perceive the basic concept of spectroscopy.

UNIT - I: ABERRATIONS

Snell's law of reflection and refraction - Reflection and refraction at spherical surfaces- Deviation produced by thin lenses - Focal length of two thin lenses in and out of contact - Cardinal Points - Refraction through a thin prism - Dispersion - Deviation without dispersion - Dispersion without deviation - Aberration - Chromatic aberration in lenses- Achromatic combination of two lenses - Spherical aberration and its removal - Optical instruments - Eye pieces - Ramsden's eyepiece - Huygen's eyepiece -Its comparison - Gauss eyepiece.

UNIT - II: INTERFERENCE

Interference of light - Coherent sources - Phase difference - Path difference - Fresnel's mirror - Fresnel's Biprism - Determination of wavelength of light, distance between two virtual sources - Lloyd's single mirror - Interference in thin films - Interference due to reflected beam - Air wedge - Newton's Rings - Determination of R and μ - Michelson's Interferometer.

UNIT - III: DIFFRACTION

Fresnel's and Fraunhofer diffraction - Fresnel's diffraction at a straight edge and Circular aperature - Zone plate - Difference between zone plate and convex lens - Fraunhofer diffraction at a single slit, double slit and N slits - Theory of plane transmission grating - Dispersive power of a grating - Resolving power of a telescope, microscope , prism and grating - Comparison of grating and prism.

UNIT - IV: POLARIZATION

Brewsterls Law - Polarisation by reflection and refraction - Law of malus - Double refraction - Nicol prism - Quarter wave - Optics axis - Ordinary and extradinary rays - Huygen's explanation of double refraction in uniaxial crystals plate - Half wave plat - Production and detection of plane, circularly and elliptically polarized light - Optical activity - Fresnel's explanation with analytical treatment - Specific rotatory power - Determination by half shade and biquartz polarimeter.

UNIT - V: SPECTROSCOPY

Types of Spectra - Fraunhofer lines - IR spectroscopy - UV spectroscopy - Rayleigh scattering - Raman effect - experimental study - Quantum theory of Raman effect- Application of Raman effect in molecular spectra - Electron spin resonance spectroscopy.

Course outcomes:
Upon completion of this course student must be able to

1. Distinguish the different types of aberrations.
2. Discuss the nature of light, its propagation and interaction with matter.
3. Explain fundamental limits in imaging and resolution of optical system due to diffraction.
4. Explain the phenomena of light ,polarization and their applications.
5. Become familiar with molecular spectroscopy and have gained basic ideas regarding UV,infrared and Raman Spectroscopy.

Books for study and reference:

1. Dr. N. Subramaniyam, Brijlal and Dr.M.N. Avathanulu, Optics, S. Chand& Co. Pvt. Ltd.- 9th revised edition, New Delhi ,2014
2. Ajoy Ghatak, Optics, (TMH), New Delhi, Fourth edition, 2009.
3. Krishnapada Ghosh Anandamoy Manna, Text book of Physical Optics,McMillan India Ltd, First edition, 2007.
4. Spectroscopy,by Gurdeep Chatwal and Sham Anand Himalaya Pub.(2009).
5. Fundamentals of Molecular spectroscopy , CN.Banwell 3rd edision Mc.Graw hill. Ltd,(2016)
6. R. Murugeshan and Kiruthiga Sivaprasath, Optics and spectroscopy, S. Chand & Co, New Delhi (2010)
7. G. Aruldass, Molecular Structure and Spectroscopy, PHI (2007).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=ML7HcZo6IaE
2. https://www.khanacademy.org/science/physics/light- waves/introduction- to-lightwaves/v/polarization- of- light- linear- and- circular
3. https://nptel.ac.in/courses/104/104/104104085/

Mapping with programme outcomes 21UPH6							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	1
CO2	9	9	9	9	9	9	9
CO3	9	9	1	9	1	1	9
CO4	9	9	9	1	3	9	9
CO5	9	9	3	9	9	9	3
Total	45	45	31	31	31	37	31
Weightage	**4.76**	**4.76**	**4.23**	**4.17**	**4.47**	**5.03**	**4.40**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC07 : ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

SUB.CODE: 21UPH7

Course objectives:
The main objectives of this course are

1. To understand the laws of electrostatics and their applications.
2. To make the students familiar with the physical quantities of magnetism and the properties of magnetic materials.
3. To acquire the skills to know about the current electricity mechanism.
4. To understand the laws of eddy current principle based on the electromagnetic inductions the current electricity mechanism.
5. To understand the basis of AC and DC Circuits and also about their sensitiveness.

UNIT - I: ELECTROSTATICS

Coulomb inverse square law - Gauss theorem- Applications,Charged sphere,Charged cylinder and Infinite plane - Coloumb's theorem - Mechanical force on unit area of charged sphere - Electrified soap bubble - Cloud formation - Capacitors - Principles - Capacity of a spherical and cylindrical capacitor.

UNIT - II: MAGNETIC PROPERTIES OF MATERIALS

Definitions of magnetic physical quantities - Cycle of magnetization and hysteresis loss- IH Curve - BH Curve - Magneto meter method - BG method - Area of BH loop - Applications of BH curve - Types of magnetic materials - Properties of dia, para, and ferro magnetic materials - Curie's laws and curie point - Applications of magnetic materials.

UNIT - III: ELECTRICITY AND MAGNETIC EFFECTS OF CURRENT

Carey -Foster bridge - Determination of specific resistance - Resistance and temperature coefficient of resistance of a coil - Magnetic field at a point along the axis of a solenoid - Ampere's theorem and its proof - Application - Field along the axis of a circular coil.
Ballistic galvanometer - Determination of quantity sensitiveness - Damping correction - Current and voltage sensitivity of galvanometer.

UNIT - IV: DC AND AC CIRCUITS

Growth and decay of charge in LR, CR - Condition for discharge to be oscillator - Determination by leakage method.
AC circuits containing double components LC,LR,CR - LCR circuit - Series and parallel resonance circuits - Q.factor - Wattless current - Choke - Power factor - Skin effect -Tesla coil.

UNIT – V: ELECTRO MAGNETIC INDUCTION

Laws of electromagnetic induction - Expression for both: Self induction and Mutual induction - Determination of L by Rayleigh's methods - Energy stored in magnetic field - Eddy current – Application - Rotating magnetic field - Rotor - Principle of induction motor - Couple acting on a coil placed in a rotating magnetic field.

Course outcomes:
After completion of this course students will be able to

1. Define and derive the laws of electrostatics.
2. Relate the properties of magnetic materials and intended applications.
3. Expertise the skills to develop the magnetic effects of current.
4. Know the derivatives of growth and decayed components of LCR series based on AC and DC Circuits.
5. Understand the concepts of electromagnetic induction and ideas about induced emf.

Books for study and reference:

1. BrijLal and N. Subrahmanyam, A Text Book of Electricity and Magnetism, Ratan Prakasan Mandir Educational & University Publishers, New Deihi,(2005).
2. R. Murugeshan, Electricity and Magnetism, S. Chand & Company Pvt. Ltd.,New Delhi (2015)
3. Electricity and Magnetism: Dr.D.N.Vasudeva - 2016, S.Chand&Co Delhi
4. Electricity and Magnetism, Nagarathanam and Lakshminarayana. S. Chand &co.(2007)
5. D. L. Sehgal, K. L. Chopra and N. K. Sehgal, Electricity and Magnetism, S.Chand & Sons. New Delhi. 1996
6. K. K. Tewari, Electricity and Magnetism, S. Chand & Co, New Delhi (2016)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.askiitians.com/revision- notes/physics/current- electricity.html
2. https://www.askiitians.com/revision- notes/physics/electromagnetic- induction- andalternating- current/

Mapping with programme outcomes 21UPH7							
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	1
CO2	9	9	9	9	3	9	9
CO3	9	9	3	9	9	1	9
CO4	9	9	9	3	9	9	9
CO5	9	9	9	9	1	9	3
Total	45	45	39	33	31	37	31
Weightage	**4.76**	**4.76**	**5.33**	**4.44**	**4.47**	**5.03**	**4.40**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC08: ATOMIC PHYSICS

SUB.CODE: 21UPH8

Course objectives:
The main objectives of this course are

1. To learn the properties of positive rays and its determination.
2. To understand the concept of photo electric cells.
3. To learn the atom models.
4. To learn the impact of electric and magnetic field on spectra.
5. To understand the concept of origin of X- rays.

UNIT - I: POSITIVE RAYS

Production and properties of positive rays -Thomson's Parabola method - Action of Electric and Magnetic fields - Determination of e/m of Positive rays - Determination of mass - Discovery of stable isotopes - Limitations - Aston's, Bain bridge and Dempster's mass spectrographs - Mass defect and packing fraction.

UNIT - II: PHOTOELECTRIC EFFECT

Introduction - Photo Electric emission - Laws - Lenard's experiment - Richardson and Compton experiment - Relation between Photoelectric current and retarding potentials - Relation between velocity of Photo electrons and the frequency of light - Laws of Photoelectric emission - Failure of electromagnetic theory - Einstein's photoelectric equations - Experimental verification of Einstein's photoelectric equation by Millikan's experiments - Photoelectric cells - Photoemissive cell - Photovoltaic cell - Photoconductive cell - Applications of Photoelectric cells.

UNIT - III: STRUCTURE OF THE ATOM

Bohr atom model - Critical Potentials - Method of excitation of atoms - Experimental determination of critical potentials - Franck and Hertz's experiment - Sommerfeld relativistic atom model - Vector atom model - Quantum numbers associated with vector atom model - Coupling Schemes (LS and JJ coupling) - Pauli's exclusion principle - Periodic classification of elements.

UNIT - IV: FINE STRUCTURE OF SPECTRAL LINES

Optical spectra - Spectral terms and notations - Selection rules - Intensity rule - Fine structure of sodium D lines Zeeman effect - Lorentz classical theory of normal Zeeman effect and expression for Zeeman shift - Debye's quantum mechanical explanation of normal Zeeman effect - Larmor's theorem - Anomalous Zeeman effect - Paschen - Back effect - Stark effect.

UNIT - V: X-RAYS

X- rays - Production - detection and properties - Bragg's law - Bragg's X- ray spectrometer - Origin and analysis of continuous X - ray spectrum and characteristic X - ray spectrum - Moseley's law Statement, Explanation and its importance - Compton effect - Derivation of expression for change in wavelength its experimental verification - Symmetry operations and elements of Symmetry.

Course outcomes:
After completion of this course students will be able to

1. Know about the experimental determination of positive rays.
2. Learned the experiments related to photo electricity.
3. Know about the various atom models and coupling schemes.
4. Understand the concept of Zeeman effect and stark effect.
5. Explain the phenomena of the origin of x- ray and its experimental verification.

Books for study and reference:

1. Modern Physics, Murugesan R. and Kiruthiga Sivaprasath. S. Chand and Company, 18th edition (2016).
2. Arthur Beiser, Shobhit Mahajan, S. RaiChoudhury, Concepts of Modern Physics, Sixth edition, SIE, (2009).
3. S.N .Ghoshal, Atomic Physics, S. Chand & Co Ltd., New Delhi, Revisededition, 2004
4. Modern Physics, Sehgal D.L. Chopra K.L. and Sehgal N.K. Sultan Chand & Sons, 9th edition, (2004).
5. Atomic Physics, Rajam J B, S. Chand and Company Ltd, New Delhi, 20th edition (2009).
6. Max Born, Atomic physics, Dover Publications Inc, 8 edition, (1990).
7. Samuel Glasstone, A Source book on Atomic energy, Krieger Publishing Company; 3rd Revised edition (2014).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.askiitians.com/revision- notes/physics/atomic- physics/
2. https://nptel.ac.in/courses/115/101/115101003/
3. https://www2.physics.ox.ac.uk/sites/default/files/2011- 10-19/atomic_physics_lectures_1_8_09_pdf_pdf_18283.pdf

Mapping with programme outcomes 21UPH8							
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	3
CO2	9	9	9	9	9	9	9
CO3	9	9	9	1	9	1	9
CO4	9	9	9	9	3	9	9
CO5	9	9	3	9	9	9	9
Total	45	45	39	31	39	37	39
Weightage	**4.76**	**4.76**	**5.33**	**4.17**	**5.63**	**5.03**	**5.54**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC09 : ANALOG ELECTRONICS

SUB.CODE: 21UPH9

Course objectives:
The main objectives of this course are

1. To study the basics of semiconductors.
2. To study the components like transistor, FET, MOSFET and UJT.
3. To study the classification of amplifiers.
4. To empower students to understand the design and working of oscillators.
5. To develop the students in designing realistic circuits to perform specified operations using op-Amp.

UNIT- I: SEMICONDUCTOR DIODES

Semiconductors - P-N Junction diodes - Characteristics - Crystal diode rectifiers - Half wave rectifiers - Efficiency of half wave rectifier - Full wave rectifier - Efficiency of full wave rectifier - Ripple factor - Filter circuits - Capacitor filter - Choke input filter - π filter. Zener diode - Avalanche breakdown - Voltage regulation using Zener diode - LED - Photo diode - Varactor diode - Schottky diode - Tunnel diode - Applications - Clipping - Clamping circuits.

UNIT- II: TRANSISTORS

CB and CE configurations - Characteristics - h parameters - Transistor biasing - Method of biasing - Transistor as an amplifier - AC and DC Equivalent circuits.
FET, JFET and MOSFET - Depletion type and Enhance type MOSFET - Characteristics and Parameters of FET - FET amplifier - UJT - Characteristics.

UNIT - III: AMPLIFIERS

Voltage and Power amplifier - Amplifier, Classification - RC Single stage amplifiers - RC coupled amplifiers, Power amplifier, Class A, Class B and Class C amplifier - Push pull amplifier - Negative feed back amplifier - Emitter follower.

UNIT - IV: OSCILLATORS

Positive feedback in amplifiers - Principles of positive feedback oscillators - LC Oscillators:Tuned base, Tuned collector, Hartley and Colpitts's oscillator - RC oscillators: Phase Shift Oscillator - Crystal oscillators - Monostable, Bistable and Astable Multivibrators - Relaxation oscillator.

UNIT - V: OPERATIONAL AMPLIFIER

Difference amplifier - Ideal operational amplifier - Characteristics - CMRR - Inverting and non - inverting Op-Amp - Parameters of Op-Amp - Applications of Op-Amp - Comparator, Voltage scale changer - Adder and subtractor - Integrator - Differentiator – Voltage follower.

Course outcomes:
After completion of this course students will be able to

1. Apply the basics of semiconductor and its applications in different areas.
2. Acquire knowledge about transistor, FET and UJT and its application.
3. Learn how to construct a transistor amplifier and how its gain varies with frequency observe the effect of positive feedback.
4. Able to design working of different Oscillators using Transistor.
5. Prepare the students for getting the knowledge about Operational Amplifier working as adder, subtractor, differentiators, integrator etc.,

Books for study and reference:

1. Principles of Electronics by V.K.Metha, Rohith Metha, S.Chand & Company,New Delhi 11th edision(2015).
2. Integrated Electronics by Jacob Milman and Christos Halkias , TMH 2nd edision (2017).
3. Theraja. B.L, Basic electronics - Solid State, S.Chand and Company Ltd (2002).
4. A.P. Malvino, D.P. Leach, Digital Principles and Application, IV Edition,Tata McGraw Hill, New Delhi, 2011
5. Gupta & Kumar, Hand book of Electronics, Pragati Prakhasan, Meerut (2012).
6. D. Chattopadhyay& P.C. Rakshit, Foundations of electronics, NewAge International Publishers (2015).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/Electronics/Basic electrnics
2. https://www.askiitians.com/revision- notes/physics/solid- and- electronic- device/
3. https://nptel.ac.in/course.html/electronics/operational amplifier

Mapping with programme outcomes 21UPH9							
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	3
CO2	9	9	9	9	1	9	9
CO3	9	9	9	9	9	1	9
CO4	9	9	9	3	1	9	9
CO5	9	9	3	9	9	9	9
Total	45	45	39	33	29	37	39
Weightage	**4.76**	**4.76**	**5.33**	**4.44**	**4.18**	**5.03**	**5.54**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC10 : PRACTICAL III

SUB.CODE: 21UPH10P

Course objectives:
The main objectives of this course are to

1. Develop the experimental skills in working with different laboratory instruments.
2. Gain knowledge about the experiments based on Electricity and Magnetism.
3. Motivate the students to apply the experimental techniques in Spectrometer.
4. Develop the experimental techniques in Potentiometer and Magnetometer.
5. Understand how C Programming language improves with object oriented features.

LIST OF EXPERIMENTS
Any 15 Experiments

Section A: General Physics Experiments (Any 12)

1. Determination of refractive index of the material of the prism by i- i' method using spectrometer.
2. Determination of dispersive power of a prism using spectrometer.
3. Determination of wavelength of mercury lines by minimum deviation method using spectrometer and grating.
4. Determination of Cauchy's constant using spectrometer.
5. Determination of refractive index of a lens by forming Newton's rings.
6. Determination of angle of a small angled prism using spectrometer.
7. Determination of quantity sensitivity of a ballistic galvanometer.
8. Determination of absolute capacity of a condenser using ballistic galvanometer.
9. Determination of self inductance of a coil by Anderson's method using ballistic galvanometer.
10. Determination of mutual inductance between pair of coils using ballistic galvanometer.
11. Comparision of mutual inductances between pairs of coils using ballistic galvanometer.
12. Determination of moment of a magnet by nullifying the field produced along the axis of a circular coil.
13. Determination of Young's modulus by Koenig's method.
14. Calibration of high range voltmeter using potentiometer.
15. Determination of emf of a thermocouple using potentiometer.

Section B: C Programming (Any 3)

1. Arranging words in alphabetical order.
2. Sorting of numbers in ascending and descending order.
3. Addition and subtraction of square matrices.
4. Conversion of Farenheit temperature into Celsius temperature.
5. Solving quadratic equation.

Expected course outcomes:
After completion of this course students will be able to

1. Analyze the concepts of viscosity,surface tension,youngs modulus of different substances.
2. Realize principles and applications of spectrometer and other optical instruments.
3. Realize principles and applications of potentiometer,and magnetometer.
4. Analyze the programming concept for physics problem.
5. Write and excute programme in C and evaluate the solution for different Mathematical Problem.

Books for study and reference:

1. A text book of Practical Physics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan, Sultan Chand&Sons,(2017).
2. Practical Physics and Electronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan Publishers,(2007).
3. Programming in ANSI C by E.Balagurusamy,Tata Mc Graw Hill,Sixth Edision,(2013).
4. Dr. S. Somasundaram, Practical Physics, Apsara publications,Tiruchirapalli, (2012).
5. K. R. Venugopal and S. R. Prasad – Programming with C – Tata McGraw-Hill Publishing Company Limited, New Delhi,(2002).
6. Arora C.L, B.Sc., Practical Physics, S.Chand & Co Ltd,(2007).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
2. https://nptel.ac.in/courses/115/105/115105110/
3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8- rZn_LgLofRX7n8z4tHYK
4. https://www.geeksforgeeks.org/introduction- to- c- programming- language/

Mapping with programme outcomes 21UPH10P							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	3
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	1	9
CO4	9	9	9	9	1	9	9
CO5	9	9	3	9	9	9	9
Total	45	45	39	39	37	37	39
Weightage	**4.76**	**4.76**	**5.35**	**5.25**	**5.35**	**5.05**	**5.56**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC11 : PRACTICAL IV

SUB.CODE: 21UPH11P

Course objectives:
The main objectives of this course are

1. To develop the experimental skills in working with different laboratory instruments.
2. To gain knowledge about the experiments based on Electricity and Magnetism.
3. To motivate the students to apply the principle of electronics in their day- to - day life.
4. To develop transforms the electronics into experimental techniques.
5. To gain knowledge about different intel 8085 microprocessor.

LIST OF EXPERIMENTS
Any 15 Experiments

Section A: Electronics Experiments (Any 12)

1. Series and Parallel resonance circuits.
2. Transistor Characteristics CE mode.
3. Regulated power supply.
4. Emitter follower amplifier.
5. Tuned collector oscillator.
6. Hartley oscillator.
7. Colpitt's oscillator.
8. Phase shift oscillator.
9. Astable multivibrator.
10. Monostable multivibrator.
11. FET characteristics.
12. Basic Logic gates - using ICs.
13. NAND and NOR as universal gates.
14. Opertional amplifier - Adder and Subtractor.
15. Operational amplifier - Integrator and Differentiator.
16. Half adder and Half subtractor.
17. Boolean expression simplifications using ICs.

Section B: Microprocessor (Any 3)

1. 8 bit addition and subtraction.
2. 8 bit multiplication and division.
3. Biggest number among a list.
4. Smallest number among a list.
5. Conversion from decimal to Hexadecimal and vice versa.
6. Square root of a number from look out table.

Expected course outcomes:
After completion of this course students will be able to

1. Design different types of power supplies,Amplifiers and Oscillators.
2. Analyze the characteristics of various electronic devices like BJT and FET.
3. Realize principles and applications of Universal gates.
4. Acquire the knowledge of the characteristics of an operational amplifier.
5. Write and excute the manipulating 8085 microprocessor programme.

Books study and reference:

1. A text book of Practical Physics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan, Sultan Chand&Sons(2017).
2. Practical Physics and Electronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan Publishers(2007).
3. B. Ram – Fundamentals of Microprocessors and Microcontrollers–Dhanpat Rai Publications (P) Ltd., New Delhi, (2013).
4. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi,(2011).
5, S. P.Singh, Advanced Practical Physics, Volume 2,Pragati Prakashan(Meerut) (2004)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics
https://www.slideshare.net/mobile/PatruniChidanandaSas/basics- of- electronics- 53962342
http://www.sircrrengg.ac.in/images/Others/CSE/MP- LAB- MANUAL.pdf
https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ

Mapping with programme outcomes 21UPH11P							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	3
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	1	9
CO4	9	9	9	9	1	9	9
CO5	9	9	3	9	3	9	9
Total	45	45	39	39	31	37	39
Weightage	**4.76**	**4.76**	**5.35**	**5.25**	**4.49**	**5.05**	**5.56**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC12 : SOLID STATE PHYSICS

SUB.CODE: 21UPH12

Course objectives:
The main objectives of this course are

1. To learn about the crystal structure and their packing parameters.
2. To know about carrier concentration in metals and semiconductors.
3. To gain the knowledge of magnetic and superconducting materials and their applications.
4. To understand the dielectric material and their properties.
5. To acquire the skill to fabricate new materials and nano phase materials.

UNIT - I: ELEMENTARY CRYSTALLOGRAPHY

Definition - Crystals and amorphous solids - Lattice parameters of an unit cell - Atomic radius-co-ordination number - Density of packing - SC - BCC - FCC - HCP structures - Diamond cubic structures - Zinc blende structure - Miller Indices - Rules to find the miller indices - Structure determination: Bragg's law - Laue method, Powder and rotating crystal method.

UNIT - II: CONDUCTING AND SEMICONDUCTING MATERIALS

Band theory of solids - Classical free electron theory of metals - Electrical conductivity - Thermal conductivity - Wiedmann - Franz law - Lorentz number -Fermi distribution function - Density of energy states - Carrier concentration in metals - Intrinsic semiconductor - Carrier concentration derivation - Extrinsic semiconductors.

UNIT - III: MAGNETIC MATERIALS AND SUPERCONDUCTING MATERIALS

Definitions - Different types of magnetic materials - Langevin's theory of dia and para magnetism - Weiss theory of magnetic materials - Ferromagnetism - Domain theory of ferromagnetism - Superconductivity - Properties - Types of Superconductors - Meissner effect - London equation - BCS theory of superconductivity: Quantative - High Temperature superconductors - Application of Superconductors.

UNIT - IV: DIELECTRIC MATERIALS

Definitions - polarizations - Different types - Electronic and ionic, orientation and space charge polarization - Frequency and temperature dependence of polarization - Internal field Claussius-Mossotti relation (no derivation) - Dielectric loss - Dielectric breakdown - Ferroelectricity and applications.

UNIT - V: NEW MATERIALS

Metallic glasses - Preparation, Properties, Applications - Shape Memory Alloys -Types of SMA - Characteristics - Properties of NiTi alloy - Applications - Advantages and disadvantages of SMA - Nano materials - Synthesis - Chemical vapour deposition - Sol-gels - Ball milling - Properties of nano materials and applications.

Course outcomes:
On the successful completion of the course student will be able to

1. Have a clear picture of crystal structures and a clear understanding about their packing parameters.
2. Now the application of conducting and semiconducting materials.
3. Expected to gain knowledge of superconductivity,,its underlying principles and its applications in modern world.
4. Update the knowledge of various types of dielectric materials and its applications.
5. Design the structure of new materials and their applications of Nano phase materials.

Books for study and reference:

1. M. Arumugam, Material Science, Anuradha Agencies, 1ST edision(2004).
2. C. Kittel, Introduction to Solid State Physics, John Wiley (2004)
3. Solid State Physics, S.L.Gupta and V.Kumar, Pragati Prakashan (2002).
4. Fundamentals of Solid State Physics, B.S.Saxena, R.C.Gupta and P.N.Saxena,Pragati Prakashan, Meerut (2010).
5. Dr. M.N. Avadhanulu, Material science, S.Chand & Company, New Delhi, 2014
6. Solid State Physics A J Deckker, Macmillan (2011).
7. V. Raghavan, Material Science and Engineering , Printice Hall India.,2004.
8. V. Rajendran, Material Science, Tata McGraw Hill Ltd, New Delhi,2001.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/RImqF8z91fU
2. https://nptel.ac.in/courses/115/105/115105099/

Mapping with programme outcomes 21UPH12							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	3
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	9
CO4	9	9	3	9	9	9	1
CO5	9	9	9	9	9	9	9
Total	45	45	39	39	39	39	31
Weightage	**4.76**	**4.76**	**5.35**	**5.25**	**5.64**	**5.32**	**4.42**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC13 : DIGITAL ELECTRONICS & MICROPROCESSOR

SUB.CODE: 21UPH13

Course objectives:
The main objectives of this course are

1. To acquire the basic knowledge of digital logic levels.
2. To learn the functions of an encoder and decoder.
3. To learn a sequential circuits such as Flip - Flop, Register, Counter.
4. To equip about the A/ D and D/A conversion and semiconductor memories.
5. To understand the basic concept of microprocessor, its architecture, addressing modes and its instruction set.

UNIT - I: NUMBER SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES

Decimal, Binary, Octal, Hexadecimal number systems - Conversion from One to Another - Weighted binary codes - ASCII code - Binary arithmetic - 1's, 2's complement addition - Boolean algebra - Basic logic gates - Laws of Boolean algebra NAND,NOR universal logic gates - Exclusive OR gate - 1's,2's complement adder - BCD adder.

UNIT - II: KARNAUGH MAP, LOGIC FAMILIES AND COMBINATIONAL SYSTEM

K map - 2,3and 4 variable K map - Reduction of Boolean expressions using Boolean laws - SOP and POS expression - Reduction using K map - Characteristics of logic families - RTL,DTL and TTL family - Half adder - Full adder - Half subtractor - full subtractor Multiplexer - Demultiplexer - Decoder - BCD to 7 segment decoder - Encoder - Decimal to BCD encoder.

UNIT - III: SEQUENTIAL SYSTEMS

Basic flip flop - RS flipflop - Clocked RS flip flop - D flip flop - T flip flop - Edge triggered JK flip flop - Master slave JK flip flop.
Ripple counter - Up and down ripple counter - Mod counter - Decade counter - Divide by N counter. Shift register - Types of Registers - Serial in, serial out shift register - Serial in parallel out shift register.

UNIT - IV: D/A AND A/D CONVERSIONS AND MEMORY DEVICES

Digital to analog conversion - Binary weighted resistor conversion - Binary ladder conversion - Analog to Digital conversion - Counter type conversion - Continuous conversion - Successive approximation conversion - Memory - Semi conductor memories - RAM - ROM memories - Flash memory - CCD memory - Cache memory

UNIT - V: MICROPROCESSOR

Major functions of Microprocessor - Timing and Control section - Arithmetic Logic Unit - Microprocessor Architecture - 8085 Microprocessor - Characteristics - Instruction set - Microprocessor Organization - Bus organization - Microprocessor Assembly Language - Simple programs for Addition, Subtraction, Choosing Biggest Number and Writing Numbers in Descending and Ascending orders.

Course outcomes:
On the successful completion of the course student will be able to

1. Understand the concepts of Binary codes.
2. Understand the operation of basic digital electronic devices.
3. Have foundation in the techniques and designing of flipflops, counters and registers.
4. Apply the gained knowledge of semiconductor memories in their day-to-day life.
5. Apply the functions of microprocessor for practical purposes.

Books for study and reference:

1. Digital Fundamentals, B.Basavaraj - Vikas publishing House private limited - 1998.
2. Don Leach, Albert Malvino, Digital principles and applications, McGraw-Hill Inc., US (1994)
3. V.Vijayendran, Digital fundamentals. S. Viswanathan Printers and Publishers Pvt. Ltd., (2009)
4. Avinashi Kapoor and L. K. Maheswari, Digital Electronics - Principles and Practice, Macmillan India Limited (2004)
5. Virendra Kumar, Digital electronics, NewAge International Publishers (2007) .
6. Fundamentals of Microprocessors and Microcontrollers- B. Ram - Dhanpat Rai Publications (P) Ltd., New Delhi, 2013.
7. Microprocessor Architecture, Programming, and Applications with the 8085 - R. S.Gaonkar- Penram International Publishing (India) Private Limited, Mumbai, 2007.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.askiitians.com/revision- notes/physics/solid- and- electronic- device/
2. https://www.tutorialspoint.com/microprocessor/microprocessor_overview.html
3. https://www.geeksforgeeks.org/introduction- of- microprocessor**/**

Mapping with programme outcomes 21UPH13							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	3	9	9	9
CO2	9	9	9	9	3	9	9
CO3	9	9	3	9	3	3	9
CO4	9	9	9	9	9	9	1
CO5	9	9	9	9	1	9	9
Total	45	45	39	39	25	39	37
Weightage	**4.76**	**4.76**	**5.35**	**5.25**	**3.62**	**5.32**	**5.28**

***S- Strong(9); M- Medium(3); L- Low(1).**

CC14 : WAVE MECHANICS AND NUCLEAR PHYSICS

SUB.CODE: 21UPH14

Course objectives:
The main objectives of this course are

1. To understand the dual nature of light and matter.
2. To acquire the knowledge of wave mechanics and its applications.
3. To acquire the knowledge to understand about nucleus and nuclear structure.
4. To familiarize with radiation detectors and particle accelerators
5. To basic knowledge on fundamental particles.

UNIT - I: DUAL NATURE OF MATTER

Introduction of matter waves - Wave velocity and group velocity - Group velocity for de Broglie waves - Relation between particle velocity and group velocity - De Broglie wavelength of electron - Davisson and Germer experiment - G.P. Thomson's experiment - Heisenberg's uncertainty principle - Applications of uncertainty principle

UNIT - II: WAVE MECHANICS

Basic postulates of wave mechanics - Derivation of time dependent Schrodinger wave equation - Properties of the wave function - Orthogonal and normalized wave functions - Eigen functions and eigen values - Applications of Schrodinger wave equation: Particle in a box,Barrier penetration problem - Linear harmonic oscillator

UNIT - III: NUCLEAR PROPERTIES

Introduction to nucleus - Properties of nuclei - Nuclear spin - Nuclear magnetic moment - Nuclear quadrupole moment.
Nuclear forces - Meson theory of nuclear forces - Nuclear models - Shell model and liquid drop model - collective model.
Nuclear fission - Energy released in nuclear fission - Bohr and wheeler's theory of nuclear fission - Atom bomb - Nuclear fusion - Source of stellar energy - Thermo nuclear reaction - Plasma - Magnetic bottle and uses.

UNIT - IV: ACCELERATORS, DETECTORS AND NUCLEAR REACTIONS

Betatron - Proton synchrotron - Ionisation chamber - Wilson cloud chamber - Bubble chamber - Spark chamber - Photographic emulsion technique - Scintillation counter.
Nuclear reactions - Main type of Nuclear reaction - Energy balance in nuclear reactions and the Q value - Examples - Threshold energy of an endoergic reaction - Nuclear transmutations - Transmutations by alpha particles, Protons, Deutrons and neutrons.

UNIT - V: NUCLEAR SPECTROSCOPY AND ELEMENTARY PARTICLES

Introduction to NMR - Quantum description of NMR - Instrumentation - Chemical shift - Spin - Spin coupling - Introduction to NQR spectroscopy - Theory of NQR - Instrumentation - Sample requirements - Applications of NQR.

Introduction to elementary particles - Antiparticles - Conservation laws and symmetry - Conservation of parity - Charge conjugation symmetry - Time reversal symmetry - Lee-Young experiment - The Quark model - CPT theorem.

Course outcomes:
On the successful completion of the course student will be able to

1. Understand the General properties of nucleus.
2. Understand Schrodinger wave equation and its application.
3. Gain a clear picture of nuclear composition and various nuclear models.
4. Understand the working of nuclear detectors and accelerators and their importance.
5. Construction of instruments utilizing the behavior of fundamental particle.

Books for study and reference:

1. Modern Physics, Murugesan R. and Kiruthiga Sivaprasath. S. Chand and Company, 18th edition (2016).
2. Modern Physics, Sehgal D.L. Chopra K.L. and Sehgal N.K. Sultan Chand & Sons, 9th edition, (2004).
3. S. N. Ghoshal,Nuclear Physics , S. Chand & Co., Edition ,(2003).
4. M L Pandya& R. P .S .Yadav, Elements of Nuclear Physics,Kedaar Nath &Ram Nath ,(2000).
5. SatyaPrakash, Nuclear Physics, A Pragati Prakasan Publication, 2011.
6. T.A. Littlefield, N. Thorley, Atomic and Nuclear Physics, Medtec, New Delhi (2013)
7. Arthur Beiser, Shobhit Mahajan, S. RaiChoudhury, Concepts of Modern Physics, Sixth edition, SIE, (2009).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1.https://nptel.ac.in/courses/115/104/115104043/
2.https://nptel.ac.in/courses/115/103/115103101/
3.https://www.youtube.com/watch?v=xrk7Mt2fx6Y

Mapping with programme outcomes 21UPH14							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	9	9	9
CO2	9	9	3	9	1	9	9
CO3	9	9	9	9	3	1	9
CO4	9	9	9	9	9	9	1
CO5	9	9	1	9	3	9	9
Total	45	45	31	45	25	37	37
Weightage	**4.76**	**4.76**	**4.25**	**6.06**	**3.62**	**5.05**	**5.28**

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE I: LASER PHYSICS AND FIBRE OPTICS

SUB.CODE: 21UPHE1

Course objectives:
The main objectives of this course are

1. To learn and understand about the basic concepts of laser and their types.
2. To learn and understand the different types of laser and their experimental verification.
3. To know about the applications of laser and the principle of holography.
4. To know the clear idea about the optical fiber communication system.
5. To understand the fundamental idea about the optical fiber and their postulates.

UNIT - I: PHYSICS OF LASERS

Basic Principle laser - Einstein's coefficients - Condition for light amplification - Population Inversion - Threshold condition - Line Shape function - Optical resonators (Qualitative only) - Three level and Four level laser systems.

UNIT- II: TYPES OF LASERS

Ruby laser - Nd YAG laser - Helium - Neon laser - Carbon- di- oxide (Co_2) laser - Dye laser - Semiconductor laser - Q Switching and Mode locking lasers(Qualitative only) - Experimental methods.

UNIT- III: APPLICATION OF LASERS

Application of laser in Industry - Cutting - Welding - Drilling - Surface hardening - Medical applications - Laser as diagnostic and therapeutic tool - Holography - Theory of construction and reconstruction - Application of holography - Holographic interferometry in nondestructive testing, acoustic holography and CD - ROM

UNIT - IV: THEORY OF OPTIC FIBRES

Basic structure of an optic fibre - Acceptance angle - Numerical aperture - Propagation of light through an optical fibre - Theory of modes formation - Classification of fibres - Step index and graded index fibres - Comparison of two types - Single mode and multimode fibres - Losses in fires - dispersion in fibres - Fabrication of fibres.

UNIT - V: FIBRE OPTIC COMMUNICATION

Optical communication - Advantages - Light sources - Modulation methods - Photo detectors - Optical couplers - Splicing - Communication systems (block diagram) - Repeaters - Fibre cables - measurements of numerical aperture and optical domain reflectometers.

Course outcomes:
On the successful completion of the course the student will be able to

1. Understand the concepts of laser and to enhance their knowledge.
2. Learn about the types of laser and their applications.
3. Learn and clear knowledge about the applications of laser.
4. Know about the concepts of theoretical part of optical fiber communication system.
5. Learn and understand the postulates of optical fiber communication and their applications.

Books for study and reference:

1. K.Thyagarajan,A.K.Ghatak,Laser theory and applications, Cambridge university press1984..
2. N. Avadhanulu , An introduction to Laser, S. Chand & Company,(2001).
3. William T. Silfvast, Laser fundamentals, University Press, Published inSouth Asia by Foundation books, New Delhi, (1998).
4. M.N.Aravamudhan, An introduction to Laser theory and application, S. Chand & Co. Pvt. Ltd (2012)
5. Nityanand Chowdry and Richa Verma, Laser systems and applications, PHI, (2011
6. Subir Kumar Sarkar - Optical fibres and Fibre Optic Communication system, S.Chand& Co, New Delhi,(2001).
7. Principles of Communication Systems, Second Edition, Taub and schilling, TataMcGraw Hill (1991).
8. Electronic Communications, Fourth Edition, Dennis Roddy and John Coolen,Prentice Hall of India (1999).

Some Free e- book URLs for Physics students

https://bookboon.com/physics- ebooks
https://www.pdfdrive.com/physics- books
https://houseofphy.blogspot.com/2018/02/free- pdf- physics- books

Mapping with programme outcomes 21UPHE1							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	9	1	9
CO2	9	9	1	9	9	9	9
CO3	9	9	9	1	9	3	9
CO4	9	9	3	9	3	9	9
CO5	9	9	9	9	9	9	1
Total	45	45	31	37	39	31	37
Weightage	**4.76**	**4.76**	**4.25**	**4.98**	**5.64**	**4.23**	**5.28**

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE II: COMPUTATIONAL PHYSICS

SUB.CODE: 21UPHE2

Course objectives:
The main objectives of this course are

1. To get basic knowledge on the fundamental concepts of C Program.
2. To exploit the appropriate decision making statements for the given program.
3. To inscribe C programs by applying the concepts of functions and strings.
4. To implement user defined data types like unions in C program.
5. To gain basic knowledge on pointers and file operation in C.

UNIT - I: DATA TYPES, OPERATORS AND EXPRESSIONS IN C

Introduction to C - structure of C program - character set - keywords and identifiers - data types - constants and variables - declaration - symbolic constants - operators - expressions - hierarchy of operators - i/o statements - formatted i/o - simple C programs : g using simple pendulum - focal length of a lens by uv method - decimal to binary and octal conversions.

UNIT - II: INPUT, OUTPUT AND CONTROL STATEMENTS IN C

If and if …else statements - nesting if …else statemnts - switch and break statements - goto statements - while, do…while statements - for statements - C program to calculate youngs's modulus and rigidity modulus, frequency of oscillator.

UNIT - III: FUNCTIONS AND STRINGS IN C

Functions - library functions - passing arguments of a function - recursion - strings - string functions -storage classes - automatic variables - global and external variables - static variables - C programs for field along the axis, projectiles - time of flight - centre of gravity of solid hemisphere...

UNIT - IV: ARRAYS, STRUCTURES AND UNIONS IN C

Defining and arrays of one and two dimensions - multidimensional arrays - structures - definition and manipulation -user defined structures - unions - definition - C programs for matrix addition, subtraction and multiplication - sorting of a list in ascending and descending order - searching.

UNIT - V: POINTERS AND FILES

Pointers - definition - declarations - operation on pointers - files - opening and closing a data file - creating a data file - processing a data file - simple file manipulation programs.

Course outcomes:
Upon completion of the course students will have

1. basic knowledge on the fundamental concepts of C Program
2. an ability to exploit the appropriate decision making statements for the given program
3. an ability to inscribe C programs by applying the concepts of functions and strings
4. an ability to implement user defined data types like unions in C program
5. basic knowledge on pointers and file operation in C

Books for study and reference:

1. E. Balagurusamy – Programming in ANSI C – Tata McGraw Hill Education Private Limited, New Delhi,2012.
2. K. R. Venugopal and S. R. Prasad – Programming with C – Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
3. Byron Gottfried, Jitender Chhabra, Programming with C, Schaum Series (2010)
4. Schaum's outline of theory and problems of programming with C.
5. Byron's Gottfried - Programming with C - TMH - New Delhi 2003.
6. S. ThamaraiSelvi and R. Murugesan, C for all, Pearson education (2012).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course. html/ computerscience an engineering// C programming
2. https://www.geeksforgeeks.org/introduction- to- c- programming- language/

Mapping with programme outcomes 21UPHE2							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	1	1	9
CO2	9	9	9	9	9	9	3
CO3	9	9	3	3	9	3	9
CO4	9	9	9	9	3	9	9
CO5	9	9	1	9	9	1	1
Total	45	45	31	39	31	23	31
Weightage	**4.76**	**4.76**	**4.25**	**5.25**	**4.49**	**3.14**	**4.42**

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE III: COMMUNICATION SYSTEMS

SUB.CODE: 21UPHE3

Course objectives:
The main objectives of this course are

1.To impart knowledge on modulation and Demodulation.
2. To understand the concepts of television and antenna parameters.
3. To acquire knowledge on radar communication.
4. To understand the basic concepts of satellite communication system.
5. To gain knowledge on GSM, GPRS, and VSAT.

UNIT - I: RADIO TRANSMISSION AND RECEPTION

Transmitter - Modulation - Types of modulation - Amplitude, Frequency and Phase modulation - Modulation factor -Side band frequencies in AM wave - Frequency modulation - Block diagram of AM and FM transmitter.
Receiver: Demodulation - AM and FM radio receivers - Super heterodyne radio receiver.

UNIT - II: TELEVISION COMMUNICATION

Television - Sound and Picture transmission - Scanning - Synchronization - Three color theory - color TV - Transmission and reception - Antennas - Equivalent circuit - Effective parameters of antenna - Dipole arrayed antennas - VHF, UHF and microwave antennas.

UNIT - III: RADAR COMMUNICATION

Basic radar system - Radar range - Antenna scanning - Pulsed radar system - A Scope - plane position indicator - Tracking radar - Moving target indicator - Doppler effect - MTI principle - CW Doppler radar - Frequency modulator CW radar.

UNIT - IV: SATELLITE COMMUNICATION

Introduction - History of satellites - Satellite orbits - Classification of satellites - Types of satellites - Basic components of satellite communication - Construction - Features of satellites - multiple access - Communication packages - Antenna - Power source - Satellite foot points - satellite communication in India.

UNIT - V: TELECOMMUNICATION SYSTEM

GSM - mobile services - Concept of Cell - system architecture - Radio interface - Logical channels and frame hierarchy - Protocols - Localization and calling - Handover - Authentication - encryption - GPRS - System architecture - VSAT (very small aperture terminals) - Modem - IPTV (internet protocol television) - Wi-Fi 2G,3G,4G and 5G (Basic concepts only).

Course outcomes:
On the successful completion of the course the student should be able to

1. Impart knowledge on modulation and Demodulation.
2. Understand the concepts of television and antenna parameters.
3. Acquire knowledge on radar communication.
4. Understand the basic concepts of satellite communication system.
5. Gain knowledge on GSM, GPRS, and VSAT.

Books for study:

1. Dennis Roddy and John Coolen, Electronic Communication, PHI, 1990.
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand & Company PVT. Ltd., (2013).
3. Communication Electronics - Louis Frenzel. Tata Mcgraw hill,3rd edision,(2017).
4. Basic Radio and Television - S.P.Sharma. Tata Mcgraw hill,2nd edision,(2017).
5. Microwave and Radar Engineering, Fourth Edition, M. Kulakarni, UmeshPublications, New Delhi (2012).

Books for reference:

1. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013
2. Poornima Thangam I, Satellite communication, Charulatha Publications, 2012.
3. Electronic communication system - George Kennedy, Bernard Davis ,S.R.M.Prasanna.

Some Free e- book URLs for Physics students
www.openculture.com\free- physics- textbooks

Mapping with programme outcomes 21UPHE3							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	1	1	9
CO2	9	9	9	3	9	9	9
CO3	9	9	3	1	3	3	3
CO4	9	9	3	9	9	9	9
CO5	9	9	9	9	1	9	3
Total	45	45	27	31	23	31	33
Weightage	**4.76**	**4.76**	**3.70**	**4.17**	**3.33**	**4.23**	**4.71**

***S- Strong(9); M- Medium(3); L- Low(1).**

PAPER I - ALLIED PHYSICS

(For B.Sc.,Mathematics and Chemistry)

SUB.CODE: 21UPHYC4

Course objectives:

The main objectives of this course are

1. To learn and understand about the basic idea of dynamics and properties of matter and their theory.
2. To know about the fundamentals of sound and heat principles and their postulates.
3. To understand and clear idea of electrostatics and current electricity and their applications.
4. To learn about the postulates of atomic theory and nuclear atom model and their characteristics.
5. To know about the basic concepts of analog and digital electronics and their characterization.

UNIT - I: DYNAMICS AND PROPERTIES OF MATTER

Impact - Direct and oblique impact of two spheres - Moment of Inertia of a solid sphere and solid cylinder - Gravitation - Determination of G by Boy's method.

Elasticity - Three modulii of Elasticity - Poisson's ratio - Relation between three modulii - Surface tension - Excess of pressure inside a bubble and drop weight method - Coefficient of viscosity - Determination of viscosity by variable pressure head method.

UNIT - II: SOUND AND HEAT

Laws of vibration in stretched strings - Sono meter - Verification of laws - Acoustics of buildings - Reverberation - Sabine formula - Ultrasonics - Production and applications.

Newton's law of cooling - Specific heat capacity of a liquid - Thermal conductivity - Coefficient of thermal conductivity of bad conductor by Lee's disc method

.

UNIT - III: OPTICS, ELECTRO STATICS AND CURRENT ELECTRICITY

Aberration - Definition of coma, Spherical aberration, Chromatic aberration – Equivalent focal length of two thin lenses eye pieces,Huygens and Ramsden eyepieces - Interference of light in thin films - Air wedge - Newton's rings - Diffraction of single slit - Grating - Determination of wave length of spectral lines - Normal incidence method.

Gauss theorem - Capacitor - dielectrics - Energy of charged conductor - Sharing of charges between two charged conductor - Potentiometer - Measurement of current, Calibration of low range voltmeter and low range ammeter.

UNIT - IV: ATOMIC PHYSICS AND NUCLEAR PHYSICS

Atom models - Vector atom model - Pauli's exclusion principle - Quantum numbers and quantization of orbits - Stern and Gerlach experiment - X-rays - Continuous and characteristics X-rays - Mosley's law.

Binding energy - General properties of nucleus - Nuclear forces and their characteristics - Nuclear models - liquid drop model - Shell model - Nuclear fission - Fusion reactions - Nuclear reactors.

UNIT - V: ANALOG AND DIGITAL ELECTRONICS

Semi conductors - P.N.Junction diode - Characteristics - Zener diode - Characteristics - Rectifiers - Zener diode as voltage regulator - Transistors - Characteristics in CE and CB mode - Binary arithmetics - Basic logic gates - Boolean algebra - Demorgan's theorem - Verification using truth tables.

Course outcomes:
On the successful completion of the course the student will be able to

1. Enhance their knowledge about properties of matter.
2. Learn and understand the fundamentals of production of sound and heat postulates.
3. Understand the clear idea of current electricity and it may improve their knowledge.
4. Learn about the atomic and nuclear physics and may able to know their applications.
5. Know the fundamentals of analog and digital electronics and their applications.

Books for study and reference:

1. A text book of sound - Brijilal and Subramanian,vikas publishing house New Delhi.(2005).
2. Heat and thermodynamics - Brijlal and Subramanian S.K.chandand Co New Delhi,(2002).
3. Optics - Brijlal and Subramanian,S.Chand and Co New Delhi,(2014).
4. Allied physics - A. Sundaravelusamy, Priya publications , Karur,(2009).
5. Properties of matter - R.Muruguesan, S.Chand& Co.(2004).
6. Electricity and Magnetism - Brijlal and Subramanian S.K.chand and Co New Delhi,(2005).
7. Digital Principles and Applications - Malvino , Leech, TMH,(2010).
8. Allied Physics - R. Murugeshan - S. Chand & Co,(2006).

Mapping with programme outcomes 21UPHYC4							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	9	1	3
CO2	9	9	9	9	9	9	9
CO3	9	9	1	3	9	3	3
CO4	9	9	9	9	1	9	9
CO5	9	9	9	9	9	9	1
Total	45	45	31	39	37	31	25
Weightage	**4.76**	**4.76**	**4.25**	**5.25**	**5.35**	**4.23**	**3.57**

***S- Strong(9); M- Medium(3); L- Low(1).**

ALLIED PHYSICS COURSE- II: PRACTICAL

(For B.sc Mathematics and Chemistry)

SUB.CODE: 21UPHYD4P

Course objectives:
The main objectives of this course are

1. To develop the experimental skills in Mechanics and Properties of matter.
2. To gain knowledge about the experiments based on Electricity and Magnetism.
3. To motivate the students to apply the experimental techniques in Optics.
4. To develop the experimental techniques in Sound.
5. To motivate the students to apply the experimental techniques in Transmission.

LIST OF EXPERIMENTS
(Any 15 Experiments)

1. Determination of young's modulus by non uniform bending (pin and microscope.
2. Determination of surface tension and interfacial surface tension by drop weight method.
3. Verification of law of transverse vibrations in a stretched string using sonometer.
4. Determination of viscosity by graduated burrette method.
5. Determination of specific heat capacity of liquid by Newton's cooling method.
6. Determination of thermal conductivity of bad conductor by Lee's disc method.
7. Determination of refractive index of material of the prism by spectrometer.
8. Study of VI characteristics of a junction diode.
9. Determination of radius of curvature of a convex lens by forming Newton's ring.
10. Determine the resistance using potentiometer.
11. Determination of g and k using compound pendulum.
12. Construction of full wave rectifier with filters.
13. Determine the figure of merit of a mirror galvanometer.
14. Determine the emf of a thermocouple by the direct deflection method.
15. Determine the prominent lines mercury spectrum by placing a grating in normal incidence position.
16. Determine the specific resistance of a wire using Carey Foster bridge.
17. Determine the focal length of a long focal convex lens.
18. Construction of low range power pack using two diodes.

Expected course outcomes:
After completion of this course students will be able to

1. Analyze the concepts of Viscosity,Surface tension,Youngs modulus of different substances.
2. Realize principles and applications of spectrometer and other optical instruments.
3. Realize principles and applications of Potentiometer,Sonameter,Magnetometer.
4. Acquire the knowledge of the characteristics of an PN junction diode and Zener diode.
5. Realize principles and applications of Transmission of heat.

Books for reference:

1. A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017).
2. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007).
3. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi,(2011).
4. S. P.Singh, Advanced Practical Physics, Volume 2,Pragati Prakashan(Meerut) (2004)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
2. https://nptel.ac.in/courses/115/105/115105110/
   https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8- rZn_LgLofRX7n8z4Thyk

Mapping with programme outcomes 21UPHYD4P							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	3	9	9	9
CO2	9	9	9	9	9	9	1
CO3	9	9	9	9	3	1	9
CO4	9	9	9	3	9	9	9
CO5	9	9	1	9	9	3	1
Total	45	45	31	33	39	31	29
Weightage	**4.76**	**4.76**	**4.25**	**4.44**	**5.64**	**4.23**	**4.14**

***S- Strong(9); M- Medium(3); L- Low(1).**

ALLIED PAPER 1 - APPLIED PHYSICS
(For B.sc computer science)

SUB.CODE: 21UPHCYC4

Courseobjectives:
The main objectives of this course are

1. To impart knowledge on the concepts of electric and magnetic materials.
2. To develop knowledge on the fundamental laws of electromagnetism.
3. To explain the theory of semiconductors and diodes.
4. To understand the basic lasing action and types of lasers.
5. To study the applications of operational amplifier and optoelectronic devices.

UNIT - I: ELECTROSTATICS AND MAGNETOSTATICS

Electric field and electric Intensity- Potential at a point due to a point charge - Relation between potential and field - Equipotential surface - Capacitors - Principle - Speherical and Cylindrical capacitors - Types of capacitor
.Magnetic potential at a point due to an isolated pole and potential due to a dipole - Radiation between magnetic potential and intensity - Magnetic shell - Potential at any point due to a magnetic shell - dia,para and ferro magnetic substances and their properties - Hysteresis.

UNIT - II: CURRENT ELECTRICITY AND ELECTROMAGNETISM

Ohm's law - Kirchoff's laws - Wheatstone's bridge - Condition for balance - Carey Foster's bridge and measurement of resistance - Potentiometer - Measurement of current and resistance.Laws of electromagnetic induction - Eddy current and its application - Transformer theory and energy losses - AC circuit containing R only, C only - AC circuit containing L and R only - AC circuit containing C and R - Power in a pure resistive circuit - Power factor - Wattless currents - Choke - AC circuit having L,C and R in series and parallel.

UNIT - III: SEMICONDUCTOR PHYSICS

Theory of energy bands in crystals - Distinction between conductors, insulators and semiconductors - Intrinsic and extrinsic semiconductors - Junction diode and Zener diode - Avalanche break down - PNP and NPN transistors - DC characteristics of CB and CE configurations - Functions of a transistor in amplifiers and Oscillator - FET - N channel and P channel FET - Performance and characteristics.

UNIT - IV: LASERS AND MASERS

Principle of LASER - Properties of LASER - Basic concepts of stimulated emission, induced absorption and spontaneous emission - Pumping action - Population inversion and meta stable state - Ammonia maser - Ruby laser - He- Ne laser - Semi conductor laser and Dye laser CO_2 LASER - Uses of laser.

UNIT - V: OPERATIONAL AMPLIFIERS AND ELECTRONIC DEVICES

The basic operational amplifier - Inverting and non-inverting operational amplifier - Basic uses of operational amplifier as sign changer, Differentiator, Integrator, Adder and Subtractor.LED - Radiation - Transition - Emission spectra - Methods of excitation visible materials for LED - LED

configuration and performance - Photo conduction - Photo diode - Photo transistors - Seven segment displays - LCD.

Course outcomes:
Upon completion of the course the student will be able to

1. Impart knowledge on the concepts of electric and magnetic materials.
2. Develop knowledge on the fundamental laws of electromagnetism.
3. Explain the theory of semiconductors and diodes.
4. Understand the basic lasing action and types of lasers.
5. Study the applications of operational amplifier and optoelectronic devices.

Books for study and reference:

1. Electricity and Magnetism by Brijlal and Subramanian, S.K.chand and Co New Delhi,(2005).
2. Electricity and Magnetism by D.N. Vasudeva. 2016, S.Chand&Co Delhi.
3. N. Avadhanulu , An introduction to Laser, S. Chand & Company,(2001).
4. Principles of Electronics by V.K.Metha, Rohith Metha, S.Chand & Company,New Delhi 11th edision(2015).
5. Theraja. B.L, Basic electronics - Solid State, S.Chand and Company Ltd (2002).
6. Integrated Electronics by Jacob Milman and Christos Halkias , TMH 2nd edision (2017).
7. K.Thyagarajan, A.K.Ghatak- Laser Theory and applications.Cambridge University Press.1983.
8. Electricity and Magnetism by R.Murugeshan ,S. Chand & Company Pvt. Ltd.,New Delhi (2015)
9. M. Arumugam, Material Science, Anuradha Agencies, 1ST edision(2004).

Mapping with programme outcomes 21UPHCYC4							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	3	1	3
CO2	9	9	9	9	9	9	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	9	1	9	9
CO5	9	9	9	1	9	3	1
Total	45	45	33	31	31	25	25
Weightage	**4.76**	**4.76**	**4.53**	**4.17**	**4.49**	**3.41**	**3.57**

***S- Strong(9); M- Medium(3); L- Low(1).**

ALLIED PHYSICS COURSE -II : APPLIED PHYSICS PRACTICAL

(For B.sc computer science) **SUB.CODE: 21UPHCYD4P**

Course objectives:
The main objectives of this course are

1. To develop the experimental skills in mechanics and properties of matter.
2. To gain knowledge about the experiments based on electricity and magnetism.
3. To motivate the students to apply the experimental techniques in optics.
4. To develop the experimental techniques in sound.
5. To motivate the students to apply the experimental techniques in transmission.

LIST OF EXPERIMENTS
(Any 15 Experiments)

1. Specific resistance by potentiometer.
2. Calibration of ammeter using potentiometer.
3. Specific resistance by Carey Foster bridge.
4. Field along the axis of a coil -M.
5. Figure of merit of a mirror galvanometer.
6. Series resonance circuit.
7. Characteristics of a junction diode.
8. Characteristics of a zener diode.
9. Transistor characteristics -CE configuration.
10. Full wave rectifier construction with filters.
11. Voltage regulator using zener diode.
12. Transistor- single stage RC amplifier.
13. Operational amplifier -adder and subtractor.
14. Astable multivibrator using transistors.
15. LDR characteristics.
16. Hartley Oscillator.
17. FET characteristics.
18. Characteristics of a photo voltaic cell.
19. Verification of truth tables of AND, OR ,NOT & EXOR gates using ICs.
20. NAND and NOR as universal gates.

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Expected course outcomes:
After completion of this course students will be able to

1. Analyze the concepts of viscosity,surface tension,youngs modulus of different substances.
2. Realize principles and applications of spectrometer and other optical instruments.
3. Realize principles and applications of potentiometer,sonameter,Magnetometer.
4. Acquire the knowledge of the characteristics of an PN junction diode and Zener diode.
5. Realize principles and applications of transmission of heat.

Books for reference:

1. A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
2. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007 **).**
3. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi,(2011).
4. S. P.Singh, Advanced Practical Physics, Volume 2,Pragati Prakashan(Meerut) (2004)
5. Arora C.L, B.Sc., Practical Physics, S.Chand & Co Ltd,(2007).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
2. https://nptel.ac.in/courses/115/105/115105110/
3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8- rZn_LgLofRX7n8z4tHYK

Mapping with programme outcomes (21UPHCYD4P)							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	3	9	9	3
CO2	9	9	9	9	3	9	9
CO3	9	9	3	9	9	1	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	1	1	9	1
Total	45	45	33	31	31	37	31
Weightage	**4.76**	**4.76**	**4.53**	**4.17**	**4.49**	**5.05**	**4.42**

***S- Strong(9); M- Medium(3); L- Low(1)**

NON MAJOR ELECTIVE COURSE - I COMMUNICATION ELECTRONICS

SUB.CODE: 21UPHNMEC1

Course objectives:
The main objectives of this course are

1. To impart knowledge on the basic concepts of AM and FM
2. To enrich knowledge on color television
3. To analyze the performance of antenna parameters
4. To get thorough knowledge on optical fiber communication
5. To know the various types of telephone

UNIT - I: RADIO COMMUNICATION

Modulation - Types of modulation - Amplitude, Frequency and Phase modulation- Modulation index -schemtic diagram of AM and FM - Ionosphere - Radio transmitter - Radio detector.

UNIT - II: COLOR TELEVISION

Television - Basic principles of colourtelevision - Scanning - Synchronization - Three color theory - color TV - Transmission and reception.

UNIT - III: ANTENNAS

Antenna - Equivalent circuit - Radiation resistance - Effective parameters of antenna - Dipole arrayed antennas -VHF, UHF and microwave antennas.

UNIT - IV: OPTICAL FIBER COMMUNICATION

Electromagnetic spectrum- Visible region - Total internal reflection - Propagation of light through an optical fiber - Types of optical fiber- Fiber communication system - Applications: endoscope - sensor - Numerical aperture and acceptance angle - Temperature sensor.

UNIT - V: LANDLINE AND MOBILE COMMUNICATION

Telephone - Block diagram - FAX - Facsimile transmitter- Receiver - Mobile phone: Cell phone architecture - Cellular telephone unit - Types of cellular telephones system- Internet: function - Application

Course outcomes:
At the end of the course the student will be able to

1. Impart knowledge on the basic concepts of AM and FM.
2. Enrich knowledge on color television.
3. Analyze the performance of antenna parameters.
4. Get thorough knowledge on optical fiber communication.
5. Know the various types of telephone.

Books for study and reference:

1. Dennis Roddy and John Coolen, Electronic Communication, PHI, (1990).
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand & Company PVT. Ltd., (2013).
3. Communication Electronics - Louis Frenzel. Tata Mcgraw hill,3rd edision,(2017).
4. Basic Radio and Television - S.P.Sharma. Tata Mcgraw hill,2nd edision,(2017).
5. Optical fiber communication and sensors,Dr.M.Arumugam,Anurad Pablication,(2016).
6. Communication Electronics - D.A.Deshpande. Tata Mcgraw hill,(1989).
7. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013

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www.physicsdatabase.com/free- physics- books

NON MAJOR ELECTIVE COURSE - II ENERGY PHYSICS

SUB.CODE: 21UPHNMEC2

Course objectives:
The main objectives of this course are

1.To develop knowledge and skills in the understanding of solar energy.
2.To acquire the basic knowledge on wind energy.
3.To gain knowledge on the fundamentals of Bio- mass energy.
4.To understand the concepts of fuel cells and their types.
5.To exploit ocean thermal and tidal energy

UNIT - I: SOLAR ENERGY

Solar constant - Solar radiation measurements - Physical principles of conversion of solar radiation into heat - Flat plate collectors - Solar air heaters - Concentrating collectors - Focusing type - Advantages and disadvantages of concentrating collectors over flat plate collectors - Solar pond - Applications : Solar water heating - Solar photo voltaic- Solar green houses.

UNIT - II: WIND ENERGY

Basic principles of wind energy conversion - Site selection considerations - Basic components of wind energy conversion system - Types of wind machines - Energy storage - Applications: Electric generation

UNIT - III: BIO-MASS ENERGY

Bio-mass - Bio mass conversion technology - Wet processes - Dry processes - Photo synthesis - Bio gas generation - Types of bio gas plants - Khadi and Village Industrie - Pragati design - Utilization of bio-gas.

UNIT - IV: CHEMICAL ENERGY

Fuel cells -Types of fuel cells - Advantages and disadvantages of fuel cell - Types of electrodes- Applications of fuel cells - Battery - Different types of battery arrangement - Classification of batteries - Lead acid battery - Nickel -iron cell.

UNIT - V: OCEAN THERMAL AND TIDAL ENERGY

Ocean Thermal Electric Conversion (OTEC) - Open cycle OTEC - site selection - energy utilization - Tidal energy - Basic principle of tidal power - Operation methods of utilization of tidal energy - Single basin and double basin arrangement - Storage - Advantages and limitations of tidal power generation.

Course outcomes:

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

1. Develop knowledge and skills in the understanding of solar energy.
2. Acquire the basic knowledge on wind energy.
3. Gain knowledge on the fundamentals of Bio - mass energy.
4. Understand the concepts of fuel cells and their types.
5. Exploit ocean thermal and tidal energy.

Books for study and reference:

1. Non-conventional energy sources - G.D.Rai,Khanna Publication, (1988).
2. Solar energy utilization - G.D.Rai,5th edision, Khanna Publishers (1995).
3. D.P. Kothari, K.C. Singal & Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India Pvt. Ltd., New Delhi(2008).
4. Suhas P Sukhatme, Solar energy -- Principles of thermal collection and storage, Tata McGraw-Hill Publishing company, New Delhi, Second edition, 2012.
5. S.A. Abbasiand Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd., New Delhi (2008).

ADD ON / ALTERNATIVE ELECTIVE COURSES

MAJOR ELECTIVE - I: ELECTRICAL APPLIANCES

SUB.CODE: 21UPHE1A

Course objectives:
The main objectives of this course are

1. To know the fundamentals parts of electric iron, mixer and grinder
2. To create the ability to arrange the parts of fan and fluorescent lamp
3. To educate and train to know the parts of Air Conditioner and Refrigerator
4. To understand the concepts and types of washing machines
5. To impart skills in the House wiring

UNIT - I: AUTOMATIC ELECTRIC IRON, MIXER AND GRINDER

Parts of an automatic electric iron box - Heating arrangement -Thermostat - wiring requirements - Non sticking contact surface - Parts of a mixer - motor - RPM control - Over load indicator - Parts of a grinder - motor - Grinding arrangement - Trouble shooting.

UNIT - II: ELECTRIC FAN AND FLUORESCENT LAMP

Parts of a fan - Motor - winding - Rotor and stator - Swing arrangement of a table fan - Use of condenser and regulators

Parts - Choke - Starter - Bulb - Wattage calculation - Luminous efficacy - Compact fluorescent lamps

UNIT - III: AIR CONDITIONERS AND REFRIGERATORS

Parts of an A/C and refrigerator - Power supply - Compressor loads - Tonnage calculation - location selection for installation

UNIIT - IV: WASHING MACHINES

Parts of a washing machine - Supply load - Water supply - Earthing - Automatic and semiautomatic type machines - Motor speed control - Over load indication

UNIT - V: HOUSE WIRING

Single phase - Two phase and three phase electrical supply - Neutral and line - Fuse wire and working of a fuse - Tripper- Switch installation - One way and two way switches - Plugs - Wiring for lamps and motors.

Course outcomes:
On the successful completion of the course, the student should be able to

1. Know the fundamentals parts of electric iron, mixer and grinder.
2. Create the ability to arrange the parts of fan and fluorescent lamp.
3. Educate and train to know the parts of air conditioner and refrigerator.
4. Understand the concepts and types of washing machines.
5. Impart skills in the House wiring.

Books for study and reference:

1. L. R. Hans & M. L. Anwani, Basic shop practicals in Electrical Engineering, Dhanpat Rai, Delhi Xavier and Radhakrishnan (Tamil Version)2016.
2. J.B. Gupta, An integrated course in electrical engineering, S.K. Kataria & Sons (2013).
3. B.L. Teraja and A.K. Teraja,ATextbook of Electrical Technology, S. Chand & Co. New Delhi (2006).
4. Alternating current electrical engineering, Philip Kemp, Mcmillan (2009).
5. H. Partas, Arts and Science of utilization of electrical energy DhanpatRai& Co,New Delhi(2014).

Mapping with programme outcomes 21UPHE1A							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	1	9	3	3	3
CO2	9	9	9	9	3	9	9
CO3	9	9	9	3	9	3	3
CO4	9	9	9	9	3	9	9
CO5	9	9	9	1	9	9	1

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE - II: ELECTRIC GENERATORS ANDELECTRIC MOTORS

SUB.CODE: 21UPHE2A

Course objectives:
The main objectives of this course are

1. To acquire knowledge on working principle of DC generators.
2. To give the basic ideas on various types of generators and their significance.
3. To understand the fundamental principles of poly phase system.
4. To analyze the characteristics of DC motors.
5. To develop knowledge on starters and their types.

UNIT - I: DC- GENERATORS AND WINDING

Working Principles - AC to DC by Commutator - PARTS of DC Generator - Yoke - Field Pole - Armature core e and winding - Commutator - Brushes.

Types of winding - Loop and Wave winding - EMI equation of generator - Permanent magnet generator- Electromagnet generator.

UNIT - II: TYPES OF GENERATORS AND TROUBLE SHOOTING

Series Generator - Shunt Generator - Compound Generator - Commutator - DC Generator - Losses in DC generator - Efficiency - Rating and trouble shooting.

UNIT - III: POLY PHASE SYSTEM

Different system of generation of AC supply - Two Phase system - Three phase system - Phase sequences - Three phase winding - Star and Delta - Power in a three Phase system.

UNIT - IV: DC MOTOR AND CHARACTERISTICS

Motor - Working principle of DC motor - Terns used in DC motors - Armature torque - Shaft torque - Characteristics of DC motor - Torque and Armature characteristics - Speed and Armature - Current characteristics - Efficiency of DC motor - Rating of DC motor - DC Shunt characteristics - DC series - Characteristics - Compound motor - Differential -Cummulative - Compound motor.

UNIT - V: APPLICATIONS AND GENERAL ASPECTS

Application - Necessity of starters- Types of Starters - Starting - Changing - Direction Speed variation of DC series voltage control method - Speed control of shunt voltage control method - Losses in DC motor.

Course outcomes:
On the successful completion of the course the student should be able to

1. Acquire knowledge on working principle of DC generators.
2. Give the basic ideas on various types of generators and their significance.
3. Understand the fundamental principles of poly phase system.
4. Analyze the characteristics of DC motors.
5. Develop knowledge on starters and their types.

Books for study and reference:

1. P.S. Dhogal, Basic Electrical Engineering with numerical problems vol. I and II, TMH(2019).
2. J.B. Gupta, An integrated course in electrical engineering, S.K. Kataria & Sons (2013).
3. Alternating current electrical engineering, Philip Kemp, Mcmillan (2009).
4. B.L. Teraja and A.K. Teraja,ATextbook of Electrical Technology, S. Chand & Co. New Delhi (2006).

Mapping with programme outcomes 21UPHE2A							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	1	3	3	1	3
CO2	9	9	9	9	3	9	9
CO3	9	9	9	3	9	3	3
CO4	9	9	9	9	1	9	9
CO5	9	9	3	1	9	9	1

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE - II : MOBILE COMMUNICATION

SUB.CODE: 21UPHE2B

Course Objectives:
The main objectives of this course are

1. To learn the basic concepts of wireless transmission.
2. To know the theoretical concepts of medium access control.
3. To apply the concepts of GSM and GPRS.
4. To gain knowledge about fundamentals of satellite channels.
5. To acquire a thorough knowledge of digital audio broadcasting.

UNIT - I: WIRELESS TRANSMISSION

Frequencies for radio transmission - Signals - Antennas - Signal propagation - Path loss of radio signals - Multipath propagation - Multiplexing - Space division multiplexing - Time division multiplexing - Frequency division multiplexing - Code division multiplexing - Modulation and demodulation of digital data - Amplitude, frequency and phase shift keying - Cellular systems.

UNIT - II: MEDIUM ACCESS CONTROL

Hidden and exposed terminals - Near and far terminals - Concept of space division multiple access - Time division multiple access - Frequency division multiple access - Code division multiple access - Spread aloha multiple access

UNIT - III: TELECOMMUNICATION SYSTEMS

GSM - Mobile services - system architecture - radio subsystem - radio interface - logical channels and frame hierarchy - Protocols - Localisation and calling - Handover - authentication - encryption - GPRS - architecture

UNIT - IV: SATELLITE SYSTEMS

Fundamentals - satellite channels - uplink and downlink frequencies - earthstations - GEO - LEO and MEO - Routing, localization and hand over - applications

UNIT - V BROADCAST SYSTEMS

Cyclic repetition of data - Digital audio broadcasting - multimedia object - transfer protocol - digital video broadcasting.

Course outcomes:
At the end of the course the student should be able to

1. Learn the basic concepts of wireless transmission.
2. Know the theoretical concepts of medium access control.
3. Apply the concepts of GSM and GPRS.
4. Gain knowledge about fundamentals of satellite channels.
5. Acquire a thorough knowledge of digital audio broadcasting.

Books for study and reference :

1. John Schiller, Mobile Communications, Addisson Wesley,2 nd edision (2015).
2. Communication Electronics - Louis Frenzel. Tata Mcgraw hill,3rd edision,(2017).
3. Principles of Communication Systems, Second Edition, Taub and schilling, Tata McGraw Hill (1991).
4. Poornima Thangam I, Satellite communication, Charulatha Publications, 2012
5. William C.Y. lee, Cellular telecommunication (second edition), Tata Mcgraw hill,(1991).

Some Free e- book URLs for Physics students

1. www.physicsdatabase.com/free- physics- books
2. www.openculture.com\free- physics- textbooks

Mapping with programme outcomes 21UPHE2B							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	1	1	3
CO2	9	9	9	9	3	9	9
CO3	9	9	9	3	9	1	3
CO4	9	9	9	9	1	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE - III : BIOMEDICAL INSTRUMENTATION

SUB.CODE: 21UPHE3A

Course Objectives:
The main objectives of this course are

1. To Illustrate origin of biopotential electrodes and biomedical amplifiers.
2. To understand the different types of transducers.
3. To design the various types of biosignals.
4. To learn the different measurement techniques for non- physiological parameters.
5. To Summarize different biochemical measurements.

UNIT - I: BIOPOTENTIAL ELECTRODES AND BIOMEDICAL AMPLIFIERS

Electrode - Electrolyte interface - Electrode - Skin interface - half - Cell potential - Contact impedance - polarization effects of electrode - Non polarizable electrodes - Types of electrodes - Surface - Needle and micro electrodes and their equivalent circuits - Biomedical amplifier- Basic requirements for bio-amplifier - Differential bio-amplifier - Carrier bio-amplifier - Chopper bio-amplifier - Phase Sensitive Detector.

UNIT - II: TRANSDUCERS

Characteristics - Static and dynamic - Errors in the measurements -Classification of transducers - Resistive - Capacitive - Inductive - Photoelectric - Piezoelectric and mechanoelectronics.

. UNIT - III: BIOPOTENTIAL MEASUREMENTS

Bio signals characteristics - Frequency and amplitude ranges - ECG - Einthoven‘s triangle, standard 12 lead system - Principles of vector cardiography - EEG - 10-20 electrode system - unipolar - bipolar and average mode. EMG - Unipolar and bipolar mode - Recording of ERG - EOG and EGG.

UNIT - IV: MEASUREMENT OF NON- ELECTRICAL PARAMETERS

Temperature - Respiration rate and pulse rate measurements - Blood Pressure: indirect methods Auscultatory method - Oscillometric method - Direct methods: Electronic manometer, Pressure amplifiers - Systolic - Diastolic - Mean detector circuit - Blood flow and cardiac output measurement: Indicator dilution - Thermal dilution and dye dilution method - Electromagnetic and ultrasound blood flow measurement.

UNIT - V: BIOCHEMICAL MEASUREMENT AND BIOSENSORS

Biochemical sensors - pH, pO_2 and pCO_2, Ion selective Field effect Transistor (ISFET) - Immunologically sensitive FET (IMFET) - Blood glucose sensors - Blood gas analyzers - Colorimeter - Sodium Potassium Analyser – Spectrophotometer - Blood cell counter - Auto analyzer (simplified schematic description) - Bio Sensors - Principles - Amperometric andvoltometric techniques.

Course outcomes:
At the end of the course, the student should be able to

1. Differentiate different bio potentials and biomedical amplifiers
2. understand the different types of transducers
3. Illustrate the various types of biosignals
4. Explain various technique for non- electrical physiogical measurements
5. Demonstrate different biochemical measurement techniques.

Books for study and references:

1. Leslie Cromwell,Biomedical Instrumentation and measurement‖, 2nd edition, Prentice hall of India, New Delhi, 2015.
2. John G. Webster, Medical Instrumentation Application and Design‖, 4th edition, Wiley India Pvt Ltd,New Delhi, 2015.
3. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology‖, Pearson Education, 2004.
4. Myer Kutz, Standard Handbook of Biomedical Engineering and Design‖, McGraw Hill Publisher, 2003.
5. Khandpur R.S, Handbook of Biomedical Instrumentation‖, 3rd edition, Tata McGraw- Hill New Delhi, 2014
6. Dr. M.Arumugam, Bio-medical Instrumentation,Anuradha Agencies (2002)
7. P.K. Bajpai, Biological Instrumentation and methodology, S Chand & Co (2010)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/108/105/108105101/
2. https://onlinecourses.nptel.ac.in/noc20_ee41/preview
3. https://www.classcentral.com/course/bioengineering- 20126

Mapping with programme outcomes 21UPHE3A							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	9	9	3	1	3
CO2	9	9	9	9	1	9	9
CO3	9	9	9	3	9	1	3
CO4	9	9	3	9	1	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE - III: NANO PHYSICS

SUB.CODE: 21UPHE3B

Course objectives:
The main objectives of this course are

1. To know the fundamentals of nanotechnology.
2. To be familiar with the methods for fabrications of nanostructures.
3. To gain knowledge on bionanomaterials and their applications.
4. To develop knowledge and skills in the understanding of quantum theory of nanomaterials.
5. To learn the concepts of nanostructures magnetic devices and their applications.

UNIT - I: NANOTECHNOLOGY

Introduction to nanotechnology - Shape, Size and Classification of nanoparticles - The fundamental science behind Nanotechnology - Electrons - Atoms and ions - Molecules - Metals and other materials - Biosystems - Molecular recognition - Electrical conduction and Ohm's law - Quantum mechanics and quantum ideas.

UNIT - II: TYPES OF NANO FABRICATION

Top down and Bottom up approaches - Types of nanoparticle synthesis - Chemical methods - Chemical reduction method and Sol-gel method - Physical methods - Ultrasonic irradiation and Laser ablation - Biological methods.

UNIT - III: BIONANOMATERIALS

Metals - Polymers - Hydrogels - Ceramics - Natural materials - Composites - Biologically functional materials - Nanomaterials - Nanotubes - Nanorods - Nanofibers - Applications - Solar energy - Air Conditioning - Water purification - Industrial and commercial applications - Biological medicine.

UNIT - IV: QUANTUM THEORY OF NANOMATERIALS

Development of Quantum theory of Nanomaterials: Application of Block functions in Nanomaterials - Quantum Dots: Semiconductor Quantum Dots - Introduction to lasers - Quantum Dot lasers - Quantum Cascade lasers and - Quantum Dot optical memory.

UNIT - V: NANOSTRUCTURED MAGNETIC DEVICES AND APPLICATIONS

Magnetoresistance - Giant magnetoresistance (GMR) - Tunnel magnetoresistance (TMR), Hard disks - MRAM or biosensors - Applications - Biomedical imaging agents - Data - video and audio storage products - Drug delivery and disease treatment technologies - Industrial seals - Industrial sensors.

Course outcomes:

At the end of the course the student will be able to

1. Know the fundamentals of nanotechnology.
2. Be familiar with the methods for fabrications of nanostructures.
3. Gain knowledge on bionanomaterials and their applications.
4. Develop knowledge and skills in the understanding of quantum theory of nanomaterials.
5. Learn the concepts of nanostructures magnetic devices and their applications.

Books for study and reference:

1. Shanmugam, S., Nanotechnology, MJP Publisher, TamilNadu, 2010.
2. Mark Ratner., Daniel Ratner., Nanotechnology, A Gentle Introduction to the Next Big Idea, Dorling Kindersly Publisher, New Delhi, 2006.
3. Richard Booker., Earl Boyson., Nanotechnology, John- Wiley Publisher, New Delhi, 2005.
4. Wong, J.Y., and Bronzino, D., Peterson, R., Biomaterials, CRC Press, 2007.
5. Masuo Hosokawa., Kiyoshi Nogi., Makio Naito., Toyokazu Yokoyama., Nanoparticle Technology Handbook, Elsevier Publishers,2007.
6. Carlos P.Bergmann, Nanostructured materials for engineering applications,Monica Jung de Andrade Editors, Springer Publishers.
7. Shi, D., Aktas, B., Pust, L., Mikailov, F. (Eds.)., Nanostructured Magnetic Materials and Their Applications.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. http://www.ncpre.iitb.ac.in/slotbooking/SOP/62SOP.pdf
2. https://en.wikipedia.org/wiki/Nanomaterials
3. https://www.nano.gov/you/nanotechnology- benefits

Mapping with programme outcomes 21UPHE3B							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	3	1	1
CO2	9	9	9	9	1	9	9
CO3	9	9	9	3	9	1	3
CO4	9	9	3	9	3	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1).**

MAJOR ELECTIVE- III: PLASMA PHYSICS

SUB.CODE: 21UPHE3C

Course objectives:
The main objectives of this course are

1. To interpret the basics of the plasma parameters and related fluid equations.
2. To analyze the behaviour of electromagnetic waves and electron beam with plasma.
3. To introspect the particle motions under the influence of external eletric and magnetic field.
4. To apply knowledge of physics as a basic science in solving real life and scientific problems.
5. To engage in research in the field of pure and applied physics and involve in lifelong learning.

UNIT - I: INTRODUCTION

Basic concepts of plasma - Concept of temperature - Debye length - Plasma frequency, criteria for plasmas.

UNIT - II: FLUID EQUATIONS

Response of plasma to the fields - DC conductivity - AC conductivity - RF conductivity - collisions.

UNIT - III: WAVES IN PLASMA

Plasma in relation with electromagnetic waves - Electromagnetic wave propagation - propagation in inhomogeneous plasma - Electrostatic waves in plasma - Energy flow.

UNIT - IV: INTERACTION OF PLASMAS WITH ELECTRON BEAM

Two - Stream instability - Relativistic electron beam - Plasma interaction, growth rate - Cerenkov free electron laser - Free electron laser and energy gain.

UNIT - V: PARTICLE MOTIONS IN THE FIELD

Particle motion in uniform electric fields - Particle motion in uniform magnetic fields - Non-uniform electric and magnetic fields - Time - Varying electric and magnetic fields - Curvature drifts - Adiabatic invariance - Magnetic mirror - Tokamak.

Course outcomes:
After completion of the course the student will be able to

1. Interpret the basics of the plasma parameters and related fluid equation.
2. Analyze the behaviour of electromagnetic waves and electron beam with plasma.
3. Apply knowledge of physics as a basic science in solving real life and scientific problems.
4. Engage in research in the field of pure and applied physics and involve in lifelong learning.
5. Introspect the particle motions under the influence of external eletric and magnetic field.

Books for study and reference:

1. Bellan, P. M., Fundamentals of Plasma Physics, 1st edition (Cambridge University Press, 2008)
2. Chen, F. F., Introduction to Plasma Physics and Controlled Fusion, 2nd edition, Vol. 1, (Springer, 1984)
3. Tielens, A. G. G. M., Physics and chemistry of the interstellar medium, (Cambridge University Press, 2010).
4. Dyson, J. E. and Williams, D. A., The Physics of the interstellar medium, 2nd edition (Taylor and Francis, 1997)
5. van der Hulst, J. M., The interstellar medium in galaxies, 1st edition (Astrophysics and Space Science Library, Springer; 2001)
6. Krishan, V., Astrophysical Plasmas and Fluids, 1st edition (Springer, 1999)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=wO2HS7hcSb8
2. https://ocw.mit.edu/courses/nuclear- engineering/22- 611j- introduction- to- plasma- physics- i- fall- 2003/lecturenotes/

Mapping with programme outcomes 21UPHE3C							
COs	**PO1**	**PS2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	3	1	3
CO2	9	9	9	9	1	9	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	9	3	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1)**

VALUE ADDED COURSE

VALUE ADDED COURSE - I ASTROPHYSICS

SUB.CODE: 21UPHV1

Course objectives:
The main objectives of this course are

1. To give an introductory account of the basic principles of astrophysics.
2. To analyze the behaviour of telescope and electron beam with images.
3. To introspect the particle motions under the influence of stars and galaxy,comets.
4. To apply knowledge of physics as a basic science in solving real life and eclipses.
5. To engage in research in the field of pure and applied physics and involve in lifelong learning.

UNIT - I: UNIVERSE

Birth of Modern Astronomy - Geocentric and Heliocentric theories --- Kepler's laws of planetary motion - Newtonian gravitation - Celestial sphere - Planets - Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteorites - Comets.

UNIT -II: MEASUREMENT

Telescopes - Elements of telescope - Properties of images - Types of Optical telescopes - Refracting and Reflecting telescopes- Radio telescope - Spectrograph - Limitations - Photographic photometry - Photoelectric photometry - Spectrophotometry - Detectors and image processing.

UNIT - III: SUN

Sun - Physical properties - Composition - Core - Nuclear Reactions - Photosphere - Chromosphere - Corona - Sunspots - Sunspot cycle - Solar Wind - Auroras - space weather effects - History of the Earth - Temperature of a planet - The atmosphere - Pressure and Temperature distribution - Magnetosphere - Eclipses - Solar and Lunar Eclipses.

UNIT - IV: STARS

Classification of Stars - The Harvard Classification system - Luminosity of a Star - Hertzprung-Russel Diagram - Stellar evolution using the HR diagram - Theoretical evolution of stars - White Dwarfs - Neutron stars- Black hole- Event horizon - Basic physics of Black Holes.

UNIT - V: GALAXY

Galaxy nomenclature - Types of Galaxies - Spiral - Elliptical - irregulargalaxies - Milky Way Galaxy and its structure - Rotation and Mass Distribution- Rotation curve and Doppler shift - Star clusters - Galactic clusters - Pulsars- Cosmological Models - Big bang theory - Steady state theory - Hubble's law - Olber's paradox.

Course outcomes:
After completion of the course the student will be able to

1. Interpret the basics of the planetary motion and related Asteroids.
2. Analyze the behavior of photometry and electron beam with telescope.
3. Introspect the planetary motions under the influence of Magnetosphere,eclipses.
4. Apply knowledge of physics as a basic science in solving real life and Galaxies.
5. Engage in research in the field of pure and applied physics and involve in lifelong learning.

Books for study:

1. Niclolas. A. Pananides and Thomas Arny, 1979, Introductory Astronomy,Addison Wesley Publ. Co.
2. A.Mujiber Rahman,Concept to Astrophysics,scitech Publications,Chennai.

Books for reference:

1. Abell, Morrison and Wolf, 1987, Exploration of the Universe, 5th ed., Saunders College Publ.
2. Carrol and Ostlie, 2007, Introduction to Modern Astrophysics, 2nd ed., Pearson International.
3. William J. Kaufmann, III, 1977, Macmillan Publishing company, London.
4. Abhyankar, K.D., Universities Press.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=wO2HS7hcSb8
2. https://ocw.mit.edu/courses/nuclear astronomy/22-611j-introduction-to- Astro- physics- i- fall-2003/lecturenotes/

Mapping with programme outcomes 21UPHV1							
COs	**PO1**	**PS2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	3	1	3
CO2	9	9	9	9	1	9	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	9	3	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1)**

VALUE ADDED COURSE – II WEATHER METEOROLOGY

SUB.CODE: 21UPHV2

Course objectives:
The main objectives of this course are

1. To know the fundamentals of weather meteorology.
2. To enable them to develop an awareness and understanding regarding the causes.
3. To effects of different weather phenomenon and basic forecasting techniques
4. To make them aware and understand atmosphere and weather systems.
5. To make the students to understand the present day crisis of need for climate change and weather forecasting.

UNIT - I: INTRODUCTION TO ATMOSPHERE

Elementary idea of atmosphere - Physical structure and composition - Compositional layering of the atmosphere - Variation of pressure and temperature with height - Air temperature - Requirements to measure air temperature - Temperature sensors: types; atmospheric pressure: its measurement - Cyclones and anticyclones its characteristics.

UNIT - II: MEASURING THE WEATHER

Wind - Forces acting to produce wind - Wind speed direction:units - its direction- Measuring wind speed and direction - Humidity - Clouds and rainfall - Radiation - Absorption - Emission and scattering in atmosphere - Radiation laws.

UNIT - III: WEATHER SYSTEMS

Global wind systems - Air masses and fronts: classifications - Jet streams - Local thunderstorms - Tropical cyclones: classification – Tornadoes - Hurricanes.

UNIT - IV: CLIMATE AND CLIMATE CHANGE

Climate: its classification - Causes of climate change;global warming and its outcomes - Air pollution – Aerosols - Ozone depletion - Acid rain - Environmental issues related to climate.

UNIT - V: BASICS OF WEATHER FORECASTING:

Weather forecasting: Analysis and its historical background - Need of measuring weather - Types of weather forecasting - Weather forecasting methods - Criteria of choosing weather station - Basics of choosing site and exposure - Satellites observations in weather forecasting - weather maps - Uncertainty and predictability - Probability forecasts.

Course outcomes:
On the successful completion of the course students will be able to

1. learned the working principle of weather forecasting.
2. Understand the basic ideas on, atmosphere and measuring the weather.
3. Gained knowledge about the environmental issues related to climate and tropical cyclones.
4. Acquire skills in predicting the tornadoes and hurricanes.
5. Enhance their knowledge about climate change using weather maps.

Books for studyand reference:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books.
2. The weather Observers Hand book,Stephen Burt, 2012,Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agro meteorology,S.R. Ghadekar, 2005, Agromet Publishers, Nagpur
5. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

Some Free e- book URLs for Physics students

1. www.physicsdatabase.com/free- physics- books
2. www.openculture.com\free- physics- textbooks

Mapping with programme outcomes 21UPHVA2							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	9	9	3	9	1	1	1
CO2	9	9	9	9	3	9	9
CO3	9	9	9	3	9	1	3
CO4	9	9	9	9	3	9	9
CO5	9	9	9	1	9	9	3

***S- Strong(9); M- Medium(3); L- Low(1).**