THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

ELAMBALUR, PERAMBALUR – 621 220

PG & RESEARCH DEPARTMENT OF PHYSICS

VISION

To build a base for pre-eminence and strengthen the augmentation of the institutions as a prime Institution by igniting and promoting impetuosity, interest in the study of Physics.

MISSION

- Fostering curiosity and excitement about the physical world.
- providing an exciting learning opportunity for non-physics and non-science majors that provides basic understanding of physics and problem-solving skill
- To provide high quality physics education and equipping students for higher education.
- Having faculty bring exciting and current research perspectives to the classroom.

PROGRAMME OUTCOMES

- Students are expected to acquire a core knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory , electronics, optics, special theory of relativity and modern physics
- Students are also expected to develop a written and oral communication skills in communicating physics-related topics.
- Learn to minimize contributing variables and recognize the limitations of equipment. Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.
- Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis. Analyze physical problems and develop correct solutions using natural laws.

PROGRAMME SPECIFIC OUTCOMES

- Students should learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.
- Students will develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
- Students will learn the applications of numerical techniques for modeling physical systemsfor which analytical methods are inappropriate or of limited utility.
- Students will realize and develop an understanding of the impact of physics and science on society.
- Apply conceptual understanding of the physics to general real-world situations.
- Describe the methodology of science and the relationship between observation and theory.
- Learn to minimize contributing variables and recognize the limitations of equipment.
- Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.
- Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.
- Analyze physical problems and develop correct solutions using natural laws.

2022

B.ScPHYSICS

Course Structure and Syllabus

(For the candidates admitted from the academic year 2022-2023 onwards)

CHOICE BASED CREDIT SYSTEM (CBCS)

THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Approved by NAAC, Affiliated to Bharathidasan University

ELAMBALUR, PERAMBALUR – 621 220

Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur - 621220

Bachelor of Physics - UG Course Structure under CBCS

(For the candidates admitted from the academic year 2022-2023 onwards)

Semester	Part	CourseCode	Title of the Course	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total
1	I	22UT1/22UH1	Language –IIkkalaIlakkiyam-Kavithai,Sirugathai,Uraindai,IlakkiyaVaralaaru	6	3	3	25	75	10
1	II	22UE1	English-I(Communicative English – I)	6	3	3	25	75	10
1	III	22UPH1CC1	Properties of matter and Sound	6	6	3	25	75	10
1	III	22UPH2CP1	Core Practical –I	3	-	-	-	-	-
1	III	22UMA1AC1:2	Mathematics I– (Algebra calculus)	5	3	3	25	75	10
1	III	22UMA2AC2:2	Mathematics II – (Analytical Geometry (3D), Trigonometry and Fourier Series)	2	-	-	-	-	-
1	IV	22UVE	Value Education	2	2	3	25	75	10
			Total	**30**	**17**	**-**	**-**	**-**	**50**
2	I	22UT2/22UH2	Language – IIdaikkalaIlakkiyam,Puthinam,IlakkiyaVaralaaru	6	3	3	25	75	10
2	II	22UE2	English – II (Communicative English – II)	6	3	3	25	75	10
2	III	22UPH2CC2	Mechanics	5	5	3	25	75	10
2	III	22UPH2CP1	Core Practical – I	3	4	3	40	60	10
2	III	22UMA2AC2:2	Mathematics II –(Analytical Geometry (3D), Trigonometry and Fourier Series)	3	3	3	25	75	10
2	III	22UMA2AC3:2	Mathematics III–(Differential Equations and Laplace transforms)	5	3	3	25	75	10
2	IV	22UES	Environmental Studies	2	2	3	25	75	10
			Total	**30**	**23**	**-**	**-**	**-**	**70**
3	I	22UT3/22UH3	Language – IKappiyaIlakkiyam,Nadagam,IlakkiyaVaralaaru	6	3	3	25	75	10
3	II	22UE3	English – III(Language Through Literature and Communicative Skills-I)	6	3	3	25	75	10
3	III	22UPH3CC3	Heat and Thermodynamics	6	6	3	25	75	10
3	III	22UPH4CP2	Core Practical – II	3	-	-	-	-	-
3	III	22UCH3AC4	Allied Chemistry – I	4	3	3	25	75	10
3	IV	22UCH4AP1	Volumetric and Organic Analysis- Practical	3	-	-	-	-	-
3	IV		NME1	2	2	3	25	75	10
			Total	**30**	**17**	**-**	**-**	**-**	**50**

4	I	22UT4/22UH4	Language – ISangaIlakkiyam,IlakkiyaVaralaaru,PothuKatturai	6	3	3	25	75	100
4	II	22UE4	English – IV(Language Through Literature and Communicative Skills-II)	6	3	3	25	75	100
4	III	22UPH4CC4	Electricity and Electromagnetism	5	5	3	25	75	100

4	III	22UPH4CP2	Core Practical – II	3	4	3	40	60	100
4	III	22UCH4AC5	Allied Chemistry –II	3	3	3	25	75	100
4	III	22UCH4AP1	Volumetric and Organic Analysis- Practical	3	2	3	40	60	100
4	IV		NME2	2	2	3	25	75	100
4	IV	22UPH4SBE1:1 22UPH4SBE1:2	Office Automation Weather Forecasting	2	2	3	25	75	100
			Total	**30**	**24**	**-**	**-**	**-**	**800**
5	III	22UPH5CC5	Optics and Spectroscopy	5	5	3	25	75	100
5	III	22UPH5CC6	Analog Electronics	5	5	3	25	75	100
5	III	22UPH5CC7	Atomic and Nuclear Physics	5	5	3	25	75	100
5	III	22UPH5CP3	Core Practical – III	4	3	3	40	60	100
5	III	22UPH5MBE1:1 22UPH5MBE1:2 22UPH5MBE1:3	Energy Physics Laser technology and its application Physics of earth	5	5	3	25	75	100
5	IV	22UPH5SBE2:1 22UPH5SBE2:2	Numerical Methods Introduction to Computational Physics	2	2	3	25	75	100
5	IV	22UPH5SBE3:1 22UPH5SBE3:2	Electrical Appliances Medical Physics	2	2	3	25	75	100
5	IV	22USSD	Soft Skills Development	2	2	3	25	75	100
			Total	**30**	**29**	**-**	**-**	**-**	**800**
6	III	22UPH6CC8	Quantum Mechanics	6	6	3	25	75	100
6	III	22UPH6CC9	Materials Science	6	6	3	25	75	100
6	III	22UPH6CP4	Core Practical – IV	5	4	3	40	60	100
6	III	22UPH6MBE2:1 22UPH6MBE2:2 22UPH6MBE2:3	Microprocessor fundamentals Astrophysics and cosmology Communication Physics	6	6	3	25	75	100
6	III	22UPH6MBE3:1 22UPH6MBE3:2 22UPH6MBE3:3	Mini Project Digital and Communication Electronics Opto Electronics and Fiber Optic Communication	6	6	3	25	75	100
6	V		Extension Activities	-	1	-	-	-	-
6	V	22UGS	Gender Studies	1	1	3	25	75	100
			Total	**30**	**30**	**-**	**-**	**-**	**600**
			Grand Total	**180**	**140**				**3900**

List of Allied Courses

Allied Course – I	**Allied Course II**
1. Mathematics-I	1. Chemistry / Computer Science

Paper Details:

S.No	Papers	Total
1	Tamil Paper – Part I	4
2	English Paper – PartII	4
3	Core Course Paper	9
4	Core Course Practical	6
5	Major Based Elective	3

6	Allied Course Paper	5
7	Allied Course Practical	1
8	Non-Major Elective	2
9	Skill Based Elective	3
10	Environmental Studies	1
11	Value Education	1
12	Soft Skill Development	1
13	Gender Studies	1
14	Extension Activities	1(Credit Only)

- for those who studied Tamil up to 10th +2 (Regular Stream)
- Syllabus for other Languages should be on par with Tamil at degree level
- those who studied Tamil up to 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV
- Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part- I
i) Basic Tamil I & II for other language students
ii) Special Tamil I & II for those who studied Tamil up to 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY
The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for Semester Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL
The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for Semester Examinations shall be 40% out of 60 marks [i.e. 24 marks]

NME Papers offered to Other Department
20UPH4SBE1–Office Automation

PROPERTIES OF MATTER AND SOUND

Core Course: I
Course Code: 22UPH1CC1
Hours / Week: 6
Credit: 6

Semester: I
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To know the basics of elasticity and its importance in beams, girders.
- To understand the concepts of viscosity, surface tension and the various methods to determine the parameters experimentally.
- To study the concept of simple harmonic motion in sound waves.

COURSE OUTCOMES:

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

- Identify the materials suitable for construction of buildings, based on the moduli of elasticity.
- Understand the concepts of surface tension and its applications.
- Understand the concepts of viscosity and the various methods to determine the parameters experimentally.
- Principles of diffusion and osmosis and the methods for their determination.
- Understand the physics of sound and its applications

UNIT I: ELASTICITY

Stress – Strain -Hooke's law - Stress-Strain diagram - Thermal stress- Elastic moduli - Relation between elastic constants - Poisson's ratio - Expression for Poisson's ratio in terms of elastic constants - Experimental determination of Poisson's ratio for rubber.

Bending of beams Expression for bending moment -cantilever - Expression for depression - Cantilever oscillations - Expression for time period - Experiment to find Young's modulus - Non uniform bending (Pin and microscope) – Uniform Bending – I section girder – – Applications- RigidityModulusbyTorsional pendulum and Static Torsional method.

UNIT II: SURFACE TENSION

Definition and dimensions of surface tension —– Molecular force – types of molecular forces- Angle of contact - Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface - Application spherical and cylindrical drops and bubbles- Experimental determination of surface tension - Capillary rise method - Variation of surface tension with temperature - Jaeger'sMethod- Interfacial surface tension by drop weight method.

UNIT III: VISCOSITY

Streamline flow – Turbulent flow – Critical velocity - Reynold's number - Co-efficient of viscosity and its dimension - Rate of flow of liquid in a capillary tube - Poiseuille's' formula - Experimental determination of co-efficient of viscosity of a liquid by Poiseuille's method - Ostwald's viscometer- Stokes's method - Variation of viscosity of a liquid with temperature.

UNIT IV: DIFFUSION& OSMOSIS

Diffusion of liquids - Graham's laws of diffusion in liquids – Fick's law of diffusion – Analogy between liquid diffusion and heat conduction – Experimental determination of coefficient of diffusion.

Osmosis and osmotic pressure – Laws of osmotic pressure - Experimental determination of osmotic pressure (Berkeley and Hartley method) — Elevation of the boiling point – Depression of freezing point.

UNIT V: SOUND

Simple harmonic motion – Differential equation of SHM – Composition of two SHM's in a straight line – Composition of two SHM's at right angles to each other – Lissajous's figures.

Acoustics of buildings: Conditions for good acoustics - Reverberation and Reverberation time - Absorption co-efficient - Determination of reverberation time by Sabine's formula.

BOOKS FOR STUDY:

1. Murugesan, Properties of Matter, S. Chand & Co Pvt. Ltd., New Delhi, 2012. (Unit - I, II,III&IV)
2. Subrahmanyam&BrijLal, Waves&Oscillations, Vikas Publishing House Pvt. Ltd., New Delhi, 1994 (Unit-V).
3. BrijLal&Subramaniam.N,Textbook of Sound, Vikas Publishing House, New Delhi, 1999 (Unit-V).

BOOKS FOR REFERENCE:

1. BrijLal&Subramaniam.N, Properties of Matter, Eurasia Publishing Co., NewDelhi, 1989 (Unit-I, II & III).
2. Mathur.D.S.,Elements of Properties of Matter,S. Chand Limited, New Delhi, 2008.(Unit-I, II, III & IV).

WEB LINK:

https://www.livescience.com/46506-states-of-matter.html
https://www.encyclopedia.com/science/news-wires-white-papers-and-books/properties-matter

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
I	22UPH1CC1	PROPERTIES OF MATTER AND SOUND	6	6

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 44, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:67

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	67

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MECHANICS

Core Course: I I
Course Code: 22UPH2CC2
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To study and apply the knowledge of gravitation at various situation.
- To understand the concepts of statics, hydrostatics, hydrodynamics and dynamics of charged bodies under various fields and the rigid body dynamics in terms of moment of inertia.
- To understand the concepts of transformations related to relativity theory.

COURSE OUTCOMES:

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

- Understand and define the laws involved in mechanics
- Study the behavior of rigid body dynamics
- Understand the gravitation
- Learn center of mass and system of variable mass
- Derive Bernoulli's principle and apply pressure-velocity relation in fluid flow in the field of fluid dynamics

UNIT I: MOTION OF PROJECTILE, IMPULSE, AND IMPACT

Projectile motion – Ranges of horizontal and inclined projectile motions – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – Motion of two interacting bodies – Reduced mass.

UNIT II: DYNAMICS OF RIGID BODY

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

UNIT III: GRAVITATION

Mass weight relation -Newton's law of gravitation – Applications –Acceleration due to gravity – Kepler's laws of gravitation –G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth - Value of g at poles and equator.
Gravitational field –Gravitational field due to a spherical cell – Gravitational potential – Gravitational potential due to a point mass.

UNIT IV: CENTRAL FORCE MOTION

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

UNIT V: STATICS AND HYDRODYNAMICS

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

Hydrodynamics - Equation of continuity– Pitot's tube and Venturi meter – Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and applications

BOOKS FOR STUDY:

1. Mechanics – Part I and II by NarayanaMoorthy, National Publishing Company.
2. Mechanics by D.S.Mathur, S.Chand& Co., 2ndEdition (2001).
3. Mechanics by P. Duraipandian, LaxmiDuraipandian, MuthamizhJayapragasam, Chand& Co., New Delhi (1988).
4. Properties of Matter by R.Murugeshan, S. Chand & Co., New Delhi (2001).

BOOKS FOR REFERENCE:

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

WEB LINK:

http://people.tamu.edu/~mahapatra/teaching/ch8.pdf
https://nucleoniitjeekota.com/topic-notes.php?topic=RIGID%20BODY%20DYNAMICS
https://youtu.be/lfXDJKKPGfY

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22UPH2CC2		MECHANICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓		✓	✓					
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓					
Number of Matches(✓) = 36, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:63

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	63

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

CORE PRACTICALS – I

Core Practical - I
Course Code: 22UPH2CP1
Hours / Week: 3
Credit: 4

Semester: II
Max. Marks : 100
Internal Marks : 40
External Marks : 60

COURSE OUTCOMES:
On the completion of this course the student will be able to

- Carry out the Experimental determination of rigidity modulus and acceleration due to gravity, coefficients of viscosities, and focal length of concave.
- Learn the laws of transverse vibrations as well as the laws of propagation of light
- Analyse the different frequency of the material
- Study the frequency of the different materials
- Learn the specific resistance of wire.

Any **TWELVE** experiments

1. Determination of Young's Modulus Optic lever method
2. Determination of Young's modulus – cantilever method mirror and telescope
3. Determination of Coefficient of viscosity of highly viscous liquid.
4. Determine Specific Resistance of a material of a wire using Meter Bridge.
5. Determination of acceleration due to Gravity (g) and Radius of Gyration (k) using Compound pendulum.
6. Determination of A.C Frequency using Steel wire Sonometer.
7. Determine Surface tension of a liquid by Capillary rise method.
8. Determination of Refractive Index (μ) of hollow prism using Spectrometer.
9. CRO study of wave forms –Lisajous figures f determination.
10. Determination of young's modulus by non-uniform bending – Pin and Microscope method.
11. Determination of young's modulus by Uniform bending -Pin and Microscope method.
12. Determination of Rigidity modulus Static torsion method.
13. Verification of laws of transverse vibration using Sonometer.
14. Determination of Surface tension and interfacial surface tension using drop weight method.
15. Determination of viscosity of highly viscous liquid -Stock's method.
16. Determination of η and I by Torsional pendulum method.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22UPH2CP2		CORE PRACTICALS – II			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓		
CO5	✓			✓	✓	✓	✓	✓	✓	
Number of Matches (✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:16

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	16

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

HEAT AND THERMODYNAMICS

Core Course: III
Course Code: 22UPH3CC3
Hours / Week: 6
Credit: 6

Semester: III
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To study the fundamental laws of thermodynamics and concept of entropy.
- To brief out the ideas of low temperature Physics and Radiation laws.
- To outline the concept of specific heat of liquids by theories

COURSE OUTCOMES:

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

- Learn experimental methods to determine the transmission of heat.
- Understand the laws of thermodynamics and their applications.
- Analyze Maxwell's Thermo dynamical relations and their applications
- Understand the nature of calorimetric by specific heat of solids and law of thermodynamics and entropy
- Understanding the statistical methods

UNIT I: TRANSMISSION OF HEAT

Conduction process - Thermal conductivity - Measurement of thermal conductivity by Forbe's method for good conductor and Lee's disc method for bad conductors - good conductor- Thermal radiation - Stefan's law- Newton's law from Stefan's law - Experimental determination of Stefan's constant. – Derivation of Widemann Franz law and its Applications– Thermal conductivity of Glass - Rubber.

UNIT II: SPECIFIC HEAT

Specific heat equation, examples - Specific heat capacity of solid - Specific heat capacity of liquids - Dulong and Petti's law- Variation of specific heat and atomic heat with temperature – Einstein's and Debye's theories of specific heat - Newton's law of cooling - Specific heat capacity of liquids - Barton's correction – specific heat relation.

UNIT III: THERMODYNAMICS

Zeroth law of thermodynamics – First law of thermodynamics – Thermodynamic potential – Heat engines – Reversible and irreversible process of Carnot's theorem – Second law of thermodynamics - Thermodynamic scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – Entropy diagram (T-S) – Law of increase of entropy – Maxwell's thermodynamical relations – ClausiusClapeyron's latent heat equations.

UNIT IV: PHASE TRANSITION

Combined 1^{st} and 2^{nd} law of thermodynamics – Entropy of an ideal gas – Reversible adiabatic process – Temperature – entropy diagrams – Helmholtz and Gibbs functions – Maxwell's equations - Joule-Kelvin inversion curve – Joule- Kelvin coefficient – Phase changes – Ehrenfest's classification of phase transition – Equation of state – Heat transformation – Specific heat capacity of saturated vapors – Experiment for latent heat of vaporization.

UNIT V: STATISTICAL MECHANICS

Introduction – Phase space - Microstates and microstates – Thermodynamic probability and entropy – Maxwell Boltzmann statistics to a monoatomic ideal gas – Specific heat capacity of a diatomic gas – Planck's quantum theory – Black body radiation – Bose–Einstein statistics – Fermi-Dirac Statistics.

BOOKS FOR STUDY:

1. Brijlal and Subramaniyam, Heat, Thermodynamics & Statistical Physics, S.Chand& Co., New Delhi, 2008 (Unit I to V).
2. Brijlal and Subramaniyam, Heat and Thermodynamics, S.Chand& Co., New Delhi, 2007 (Unit I to V).

BOOKS FOR REFERENCE:

1. J.B. Rajam and C.L. Arora, Heat and Thermodynamics, S. Chand & Co., 1981.
2. Sharma J.K., Sarkar K.K., Thermodynamics and Statistical Physics, Himalaya Publishing House, 1991.

WEB LINK:

https://uou.ac.in/sites/default/files/slm/BSCPH-201.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits	
III	22UPH3CC3		HEAT AND THERMODYNAMICS			6		6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓			✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	
CO5	✓	✓		✓	✓		✓		✓	
Number of Matches(✓) =40 , Relationship: high										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:61

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	61

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MAINTENANCE OF HOUSEHOLD APPLIANCES

Non Major Elective: I | Semester: III
Course Code: 22UPH3NME1 | Maximum Marks: 100
Hours / Week: 2 | Internal Marks : 25
Credit: 2 | External Marks : 75

Objectives:

- To know about the difference between Resistance, capacitance, inductance and its units
- To have a basic idea about the AC and DC, Single phase and three phase connections

LEARNING OUTCOME

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

- Understand the electric fundamental laws.
- Analyze the characteristics of transformer and its applications.
- Understand the operations and safety handling of certain commonly used domestic appliances.
- Needs a basic knowledge in electricity and the learners are expected to gain more knowledge for AC and DC
- Understand the trouble shoot electrical circuits.

UNIT-I:

Resistance - capacitance - inductance and its units - electrical charge - current - potential - units and measuring meters - Ohm's law - Galvanometer, ammeter, voltmeter and multimeter. Electrical energy - power - watt - kWh - consumption of electrical power.

UNIT-II:

Transformer - principle and working - classification of transformers - testing of transformers - Core, Shell and Berry types, auto transformer - construction and uses. Cooling of transformers - Losses in transformer.

Unit-III:

Electric bulbs – Fluorescent lamps - Street Lighting - Electric Fans - Wet Grinder - Mixer - Water Heater - Storage and Instant types-electric iron box- microwave oven - Washing Machine - Stabilizer, Fridge and Air conditioner.

UNIT-IV:

AC and DC- Single phase and three phase connections - RMS and peak values-house wiring - Star and delta connection - overloading - earthing - short circuiting - colour code for insulation wires.

UNIT-V:

Electrical protection - Relays - Fuses - Electrical switches - Circuit breakers- ELCB - overload devices - ground fault protection - Inverter - UPS - generator and motor.

BOOKS FOR STUDY AND REFERENCE

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja
3. Performance and design of AC machines - M G Say ELBS Edn.
4. Semi conductor physics and opto electronics by P K Palanichamy
5. Basic Electronics - B L Theraja - S Chand & Co.
6. Principles of Communication Engineering - Arokh Singh and A K Chhabra - S Chand & Co.

Web Link:
https://nptel.ac.in/courses/108106071

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
III	22UPH3NME1	MAINTANANCE OF HOUSEHOLD APPLIANCES	2	2

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓				
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches() = 42, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:54

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	54

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTRICITY AND ELECTROMAGNETISM

Core Course: IV | Semester: IV
Course Code: 22UPH4CC4 | MaximumMarks: 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

OBJECTIVES:

- To study the fundamental ideas of electrostatics and current electricity
- To know about the classification of magnetism depending upon their properties
- To understand the concept of series and parallel resonance circuit

COURSE OUTCOMES:

On the completion of the course students will be able to:

- Understand fundamental laws of electricity and magnetism
- Understanding the basic measurements
- Learn different magnetic materials
- Understand the Faradays laws of electromagnetic induction by Rayleigh's method
- Apply the knowledge of electricity and magnetism to technological advances

UNIT I: ELECTROSTATICS AND CONDENSERS

Fundamentals of electrostatics – Electric field– Electric potential - Coulomb's law - Lines of forces - Properties – Gauss theorem - Electric intensity due to a charged sphere and cylinder – Mechanical force on unit area of a charged surface -Capacitor– Principle of a capacitor – Series and parallel– Capacity of a spherical capacitor – Energy stored in a charged conductor – Loss of energy due to sharing of charges between two charged conductors.

UNIT II: MAGNETIC PROPERTIES OF MATERIALS

Magnetic field – Magnetic induction – Magnetic susceptibility - Intensity of Magnetization – Magnetic permeability – Susceptibility – Properties of para, dia, and ferromagnetic materials – Curie point - Curie temperature - Hysteresis – Retentivity – Coercivity – Experiment to draw B-H curve by magnetometer method – Loss of energy per cycle.

UNIT III: ELECTRIC CURRENT AND ELECTRICAL MEASUREMENTS

Biot-Savart's law – Magnetic intensity at a point due to a current carrying straight conductor - Axis of a circular coil and solenoid – Moving coil ballistic galvanometer –Kirchhoff's Law- Damping correction - Ampere's circuital law - Carey Foster's bridge – Specific resistance – Potentiometer – Principle – Ammeter calibration– Calibration of low rangeand high range voltmeter using potentiometer-uses.

UNIT IV: ELECTROMAGNETIC INDUCTION

Faraday's law - Laws of electromagnetic induction– vector form – Self and mutual induction – Self-inductance of a solenoid – Mutual inductance of a pair of solenoids – Coefficient of coupling – Experimental determination of self and mutual inductance (Rayleigh's method) - Growth decay of current in circuit containing Land R – Growth and decay of charge in circuit containing C and R – Measurement of High resistance by leakage – Charging and discharging of Capacitor through Land R.

UNIT V: AC CIRCUITS

Alternating EMF – Alternating EMF applied to circuits containing L and C, L and R, C and R – Alternating EMF applied to circuits containing L, C and R – Series and Parallel resonance circuits – Sharpness of resonance – Q factor – Power in AC circuits – Power factor – Wattless current – Transformer – Choke- Skin effect.

BOOKS FOR STUDY:

1. R. Murugeshan, Electricity and Magnetism (2008) S Chand & Co, New Delhi
2. BrijLal&Subramanyam, Electricity and Magnetism, (2005)
3. RatanPrakashanMandir Publishers, Agra
4. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.

BOOKS FOR REFERENCE:

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

WEB LINK:

https://web.njit.edu/~vitaly/121/notes121.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22UPH4CC4		ELECTRICITY AND MAGNETISM			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓			✓		✓	✓	
CO4	✓		✓	✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 35, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:70

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	01
3.	National	01
4.	Global	69

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

CORE PRACTICALS – II

Core Practical - I
Course Code: 22UPH4CP2
Hours / Week: 3
Credit: 4

Semester: III
Maximum Marks: 100
Internal Marks: 40
External Marks :60

COURSE OUTCOMES:

On the completion of this course the student will be able to

- Carry out the experimental determination of thermal conductivity, specific gravities, specific heat capacities, specific resistances of electrical conductors
- Verify the laws of transverse vibrations as well as the laws of propagation of light
- Determination of magnetic field intensity and the horizontal component of earth's magnetic field
- Find the current and voltage sensitivities of a spot galvanometer and calibrate a low range voltmeter
- Construct a bridge rectifier and voltage regulator with Pi filters and Zener diodes
- Learn the construction of full wave rectifier

Any **TWELVE** experiments

1. Determination of thermal conductivity of a bad conductor – Lee's disc method.
2. Study the Characteristics of junction and Zener diodes
3. Determination the Emissive power of a surface using Spherical calorimeter.
4. Determine the Specific heat capacity of liquid (Barton's correction) using Joule's calorimeter.
5. Determine R and ρ by Carey Foster's Bridge.
6. Determine the Specific heat capacity of a liquid by Newton's law of cooling method.
7. Determine the wavelength of spectrum using Spectrometer – Grating - Normal incidence method.
8. Determination of thermal conductivity of good conductor - Forbe's method
9. Determination of Radius of Curvature of a Convex Lens(R) by Newton's Rings method.
10. Determination of temperature coefficient of a wire using P.O. Box.
11. Calibration of Ammeter using Potentiometer.
12. Determination of Temperature coefficient of R using Potentiometer.
13. Calibration of low range voltmeter using Potentiometer.
14. Calibration High range voltmeter using Potentiometer.
15. Determine the Characteristics of Transistor by CE – configuration.
16. Construct Full wave rectifier and study its performance.
17. Deflection magnetometer - Tan C position - Moment of a bar Magnet

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22UPH3CP3		CORE PRACTICALS – III			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓			✓	✓	✓	✓	✓		✓
CO5	✓		✓	✓	✓	✓	✓	✓		
Number of Matches(✓) =44 , Relationship:										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:17

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	17

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTRONICS IN DAILY LIFE

Non Major Elective: II
Course Code: 22UPH4NME2
Hours / Week: 2
Credit: 2

Semester: IV
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

Objective

- To make non physics students understand basic electronic concepts and its applications in daily life.

LEARNING OUTCOME

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

- ✓ Introduce basic Electronics symbols and electrical formulas.
- ✓ Analyze the working of Electrical devices.
- ✓ Understand the principle and working of electronic instruments.
- ✓ Understand the principles of communication devices.
- ✓ To know how toHandling electrical appliances.

UNIT I: FUNDAMENTALS

Electrical and Electronic symbols – Resistors - Capacitors – Resistance wale – Capacitor wale – Electrical quantities – Electrical formulas – Magnetism – Meters – Fuse wire Transistors – Integrated chips.

UNIT II: ELECTRICAL APPLIANCES

Switchboard – Main box – Metal circular breakers (MCB) – AC – DC currents – Two phase – Three phase electrical connections – generators – uninterrupted power supply (UPS) – stabilizer – voltage regulators – Electrical devices – Iron box – Fan

UNIT III: ELECTRONIC HOME APPLIANCES

Radio – Audio tape-recorder, speaker – televisions – VCR – CD Player –DVD – calculators – Computers – Block diagram of a computer – Input device – Memory device – control unit – Arithmetic and logic unit – output device – microprocessor – RAM –ROM – scanner – printer – Digital camera – LCD Projectors – Display devices

UNIT IV: COMMUNICATION ELECTRONICS

Principles of optical fiber cables (OFC) – Telephone – Mobile Phones – wireless phone – Antenna – Internet.

UNIT V: SAFETY MECHANISM

Handling electrical appliances – power saving methods – hazards prevention methods – protection of Hi-Fi electronic devices.

Books for Study and reference:

1. S.S. Kamble – Electronics and Mathematics Data Book – Allied Publishers Ltd – 1997
2. Kalasi H.S - Electronics Instrumentation - Tata McGraw-Hill Education - 2004
3. William David Cooper, Electronic and Instrumentation and Measurement Technique (2nd Edition), 1978.

Web link:
https://nptel.ac.in/courses/108102146

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
IV	22UPH4NME2	ELECTRONICS IN DAILY LIFE	2	2

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓				✓
CO3	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches() = 41 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	57

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

OFFICE AUTOMATION

Skill Based Elective: I
Course Code: 22UPH4SBE1:1
Hours / Week: 2
Credit: 2

Semester: IV
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

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

- Understand the basic knowledge of Ms. Word
- Develop the skill in Ms. Word
- Understand the basic knowledge of Ms. Excel
- How to create and designing the PowerPoint
- Know the basic skill of Photoshop

UNIT I: MS-WORD - I

1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text
2. Bio data: Prepare a Bio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer and Headers.

UNIT II: MS-WORD – II

1. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a mark sheet.
2. Mail Merge: Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters.

UNIT III: MS-EXCEL

Data sorting-Ascending and Descending (both numbers and alphabets)

1. Mark list preparation for a student
2. Individual Pay Bill preparation.
3. Invoice Report preparation.
4. Drawing Graphs. Take your own table.

UNIT IV: MS-POWERPOINT

1. Create a slide show presentation for a seminar.
2. Preparation of Organization Charts

Create a slide show presentation to display percentage of marks in each semester for all students

4. Use bar chart (X-axis: Semester, Y-axis: %marks)
5. Use different presentation template different transition effect for each slide.

UNIT V: PHOTOSHOP

Introduction to Photoshop – The File menu - The tools - Drawing lines & shapes - Inserting Picture and shapes - filling colors - Text effects, working with layers, filters.

E-REFERENCES

1. https://ptgmedia.pearsoncmg.com/images/9780735623026/samplepages/9780735623026.pdf
2. https://www.dit.ie/media/ittraining/msoffice/MOAC_Excel_2016_Core.pdf
3. https://ptgmedia.pearsoncmg.com/images/9780735697799/samplepages/9780735697799.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22UPH4SBE1:1		OFFICE AUTOMATION			2			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓				
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches() = 40, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:24

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	003
2.	Regional	00
3.	National	00
4.	Global	24

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

WEATHER FORECASTING

Skill Based Elective: I
Course Code: 22UPH4SBE1:2
Hours / Week: 2
Credit: 2

Semester: IV
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques.

COURSE OUTCOMES:

On completion of the course the students will be able to

- Understand the structure of Atmosphere.
- Learn measuring the weather.
- Understanding various Weather Systems.
- Learn the climate and climate change.
- Learn the basic concepts of 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;.

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;

BOOKS FOR STUDY:

1. Aviation Meteorology, I.C. Joshi, Himalayan Books ,3rd edition 2014.
2. The weather Observers Hand book, Stephen Burt, Cambridge University Press 2012.
3. Meteorology, S.R. Ghadekar, Agromet Publishers, Nagpur-2001.

BOOKS FOR REFERENCE:

1. Text Book of Agrometeorology, S.R. Ghadekar, Agromet Publishers, Nagpur-, 2005.
2. Atmosphere and Ocean, John G. Harvey, The Artemis Press 1995.

WEB LINK:

https://nptel.ac.in/courses/119102007

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits	
IV	22UPH4SBE1:2		WEATHER FORECASTING			2		2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:36

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	36

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

OPTICS AND SPECTROSCOPY

Core Course: V
Course Code: 22UPH5CC5
Hours / Week: 5
Credit: 5

Semester: V
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To study the dispersive power of light using various lenses
- To identify the transmittance and reflection of light through various medium
- To know about the optical instruments and their resolving power

COURSE OUTCOMES:

On completion of the course the students will acquire

- The knowledge of geometric optics helps in the practical design of many optical systems and instruments including aberrations in lens system.
- Study the theory and experiment of interference using Newton's rings and Michelson interferometer
- Study the theory and experimental past of diffraction by Fresnel's and Fraunhofer methods
- Study the theories for production of polarization of light
- Understand the theory and application of microwave and infrared spectroscopy

UNIT I: GEOMETRICAL OPTICS

Optical interference - Colour of thin films - Fresnel's biprism - Fresnel's mirrors andLloyd's single mirror experiments - Achromatic fringes - Interference in thin films (from reflected and transmitted light) - Fringes in wedge shaped films - Reflective and antireflective coatings - Theory of Newton's rings - Wavelength of monochromatic light using Newton's rings - Michelson's interferometer - Determination of wavelength and refractive index -Fabry Perrot etalon (qualitative).

UNIT II: INTERFERENCE

Optical interference - Colour of thin films - Fresnel's biprism - Fresnel's mirrors andLloyd's single mirror experiments - Achromatic fringes - Interference in thin films (from reflected and transmitted light) - Fringes in wedge shaped films - Reflective and antireflective coatings - Theory of Newton's rings - Wavelength of monochromatic light using Newton's rings - Michelson's interferometer - Determination of wavelength and refractive index -Fabry Perrot etalon (qualitative) - .Fabry Perrot interferometer.

UNIT III: DIFFRACTION

Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhofer diffraction - Diffraction at a single and double slit - Diffraction of a thin wire - thick wire- Missing orders in double slit- Theory of diffraction grating.

UNIT IV: POLARIZATION

Polarization –Polarization by reflection- Double refraction - Nicol prism - Polarizer and Analyzer - Theory of production and detection of elliptically and circularly polarized light – Babinet compensator - Quarter wave plate - Half-wave plate - Optical activity – Laurent's Half shade polarimeter.

UNIT V: SPECTROSCOPY

Microwave spectroscopy - The Rotation of Molecules - Bond Length - Bond Angle - Bond energy Rotational Spectra - The Rigid Diatomic Molecule - IR Spectroscopy - FTIR Spectroscopy – its

Applications- Vibrating Diatomic Molecule as a Harmonic Oscillator - The Anharmonic Oscillator - The Diatomic Vibrating Rotator -Applications - The Vibration-Rotation Spectrum of Carbon Monoxide

BOOKS FOR STUDY:

1. A text book of Optics – Subramanyam and Brijlal, S. Chand and co.., 25th Edition, New Delhi 2004.
2. Optics and Spectroscopy – R.Murugeshan, S. Chand and co., 6th Edition,New Delhi, 2008.
3. Elements of Spectroscopy – S.L. Gupta, V.Kumar and R.C.SharmaPragatiPrakashan, 13th Edition, Meerut, 1997.
4. Molecular structure and spectroscopy – G.Aruldhass, PHI Pvt Ltd, , II Edition, New Delhi, 2007.

BOOKS FOR REFERENCE:

1. Optics – Sathyaprakash, RatanPrakashanMandhir, VIIth Edition, New Delhi, 1990.
2. Introduction to Molecular Spectroscopy –C.N.Banewell,TMHpublishingco. IV Edition, New Delhi, 2006.
3. AjoyGhatak, *Optics*, (TMH), New Delhi, Fourth edition, 2009.
4. Singh & Agarwal, *Optics and Atomic Physics*, PragatiPrakashan Meerut, Nineth edition, 2002.
5. Fundamentals of Physics, by D.Halliday, R. Resnick and J. Walker, Wiley, 6thEd

WEB LINK:

https://www.uou.ac.in/sites/default/files/slm/BSCPH-202.pdf
https://youtu.be/7jOSbtR8mTs
https://youtu.be/tSW3CDiNvj4

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5CC5		OPTICS AND SPECTROSCOPY			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓			✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 45, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:62

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	62

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ANALOG ELECTRONICS

Core Course: VI
Course Code: 22UPH5CC6
Hours / Week: 5
Credit: 5

Semester: V
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To know about the intrinsic and extrinsic semiconductors
- To understand the transistor circuit configuration
- To know about the characteristics of operational amplifiers.

COURSE OUTCOMES:

On completion of the course the students will be able to:

- Understand the fundamental principles of semiconductors including p-n junctions and zener diode
- Analyze the characteristics of transistor and transistor biasing circuits
- Analyze the relationship between amplifier and oscillators
- Learn FET
- Understand the applications of Op-Amps inverting and non-inverting modes.

UNIT I: SEMICONDUCTORS AND DIODES

Intrinsic and extrinsic semiconductor – PN junction diode – Biasing of PN junction – V-I Characteristics of diode – Rectifiers – Half wave – Full wave and bridge rectifiers – Break down mechanisms – Zenerdiode: Characteristics – Zener diode as voltage regulator.

UNIT II: TRANSISTORS

Introduction – Transistor– npn - pnp transistors – Transistor action – Transistor configurations – Common base configuration – CB characteristics – CE characteristics – Relation between α and β – Voltage divider biasing - Transistor as an amplifier – Transistor as a two-part network – h parameters.

UNIT III: AMPLIFIERS AND OSCILLATORS

Single stage CE amplifier –input impedance of CE amplifier– Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class B power amplifier – Push–pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitts's oscillator – Wein bridge oscillator – Phase shift oscillator.

UNIT IV: SPECIAL SEMICONDUCTOR DEVICES

Field effect transistors – Characteristics of FET – Parameters - JFET- Working and Characteristics of JFET - Difference between JFET and Bipolar Transistor –WorkingandV-I characteristics of SCR, UJT - UJT as relaxation oscillator.

UNIT V: OPERATIONAL AMPLIFIERS

Voltage feed back model -Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications- Adder – Subtractor – Integrator – Differentiator – Unity gain buffer.Class A- Class B Amplifier.

BOOKS FOR STUDY:

1. Hand Book of Electronics by Gupta and Kumar –PragatiPrakashan – Meerut (2002).
2. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand &Co. (2006).
3. Electronics by M. Arul Thalapathi, ComptekPublishers (2005).
4. Elements of Electronics by M.K.Bagde and Singh S.P., S. Chand & Co., NewDelhi(1990).

5. Applied Electronics by A. Subramanyam – National Publishing Co.(1997)
6. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, PrenticeHall of India(1994).

BOOKS FOR REFERENCE:

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

WEB LINK:

https://nptel.ac.in/courses/117106087

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5CC6		ANALOG ELECTRONICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓				✓	✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 61

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	61

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ATOMIC AND NUCLEAR PHYSICS

Core Course: VII
Course Code: 22UPH5CC7
Hours / Week: 5
Credit: 5

Semester: V
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVE:

- To provide an introductory account about the atomic structure and nuclear reactions.

COURSE OUTCOMES:

On completion of the course the students will have:

- Learn the band theory of solids
- Analyze the different spectrograph
- Adequate knowledge on the fundamental principles governing the structure of the atom and the interactions of particles at high energies.
- Understand the evolution of spectral lines
- Understand the properties of x-rays verification

UNIT I: BAND THEORY OF SOLIDS

The free electron theory of metals – expressions for electrical conductivity – thermal conductivity – Wiedman-Franz's law-Hall effect-magneto resistance-determination of electronic charge – Millikan's oil drop method – electron microscope – Band theory of solids – classification of solids on the basis of band theory.

UNIT II: ATOMIC STRUCTURE

Early atomic spectra-Thomson Model-Alpha particle scattering-Rutherford 's nuclear model-drawbacks-Bohr atom model –Bohr's interpretation of the Hydrogen spectrum-correction for nuclear motion-evidences in favour of Bohr's theory-Ritz combination principle-correspondence principle-Summerfield's relativistic atom model-drawbacks- the vector atom model – Quantum numbers associated with the vector atom model — the Pauli's exclusion principle – periodic classification of elements

UNIT III: PROPERTIES OF NUCLEI

General properties of nucleus- binding energy – BE/A curve - significance -proton electron theory-proton neutron theory -Nuclear forces –characteristics –Meson theory of nuclear forces – Yukava Potential- Nuclear models.

UNIT IV: RADIO ACTIVITY

Fundamental laws of radio activity –theory of α ,β and Υ decay- properties of alpha, beta and gamma rays - neutrino and its properties-electron capture. - nuclear isomers- Mossabauer effect - Applicationss-Radio carbon dating- radio isotopes – uses.

UNIT V: NUCLEAR REACTIONS

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

BOOKS FOR STUDY:

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co., NewDelhi(2008).
2. Modern Physics by D.L.Sehgal, K.L.Chopra and N.K.Sehgal. Sultan Chand & Sons Publication, 7th Edition, New Delhi(1991).
3. Atomic Physics by J.B. Rajam, S. Chand & Co., 20thEdition, New Delhi (2004).
4. Atomic and Nuclear Physics by N. Subrahmanyam and BrijLal, S. Chand & Co. 5th Edition, New Delhi(2000).

BOOKS FOR REFERENCE:

1. Modern Physics by J.H. Hamilton and Yang, McGraw-Hill Publication, (1996).
2. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi (1997).
3. Fundamentals of Physics by D.Halliday, R.Resnick and J. Walker, Wiley, 6thEdition, New York(2001).
4. Modern Physics by Kenneth S.Krane, John Willey & sons, Canada (1998

WEB LINK:

https://nptel.ac.in/courses/115101003

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5CC7		ATOMIC PHYSICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 43, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:62

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	62

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

CORE PRACTICAL - III

Core Practical – III
Course Code: 22UPH5CP3
Hours / Week: 4
Credit: 3

Semester: V
Maximum Marks: 100
Internal Marks : 40
External Marks : 60

COURSE OUTCOMES:

On the completion of this course the student will be able to

- Carry out the experimental determination of moduli of elasticity
- Find the current and voltage sensitivities of a spot galvanometer and calibrate a high range voltmeter
- Determination of wavelengths of light ray components
- Experimental determination of refractive index of glass, self incuctance of a coil, magnetic field intensity
- Voltage-current characteristics of diodes and their applications

Any TWELVE Experiments

1. Determination of Young's modulus using Uniform bending Koenig's method.
2. Determination of Spectrometer i-i' curve.
3. Determine Small angle of prismusing Spectrometer.
4. Determine deviation and dispersive power of Grating using angle of minimumdeviation method.
5. Determination of Cauchy's constants by Spectrometer.
6. Determination of Fraunhofer lines using Spectrometer.
7. Determine Hartmann's Formula using Spectrometer.
8. Study the Characteristicsof FET.
9. Construct and study the performance of FET amplifier.
10. Construct and study the performance of Hartley oscillator using transistor.
11. Construct and study the performance of Colpitts's oscillator using transistor.
12. Construct Op – Amp – Adder and Subtractor.
13. Construct Op – Amp – Integrator and Differentiator.
14. Determination of M using Field along the axis of a coil.
15. M and H – Absolute determination using deflection and vibration magnetometer.
16. EMF of a thermocouple using Potentiometer.
17. Find the value of x of thermistor using potentiometer.
18. Determine AC self-inductance of a coil using Anderson's bridge.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5CP5		CORE PRACTICAL V			4			3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:18

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	18

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

ENERGY PHYSICS

Major Based Elective: I | Semester: V
Course Code: 22UPH5MBE1:1 | Maximum Marks: 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

OBJECTIVES:

- To know about the World's reserve of Commercial energy sources and their availability
- To appreciate the Classification and description of wind machines, wind energy collectors

COURSE OUTCOMES:

On completion of the course the students will have:

- Understand the basics of energy sources
- Basic concepts of solar radiation such as spectral distribution, estimation of radiation intensity and their related instruments solar devices such as solar collectors, solar storage devices
- Learn the basic ideas of photovoltaic system and its applications
- Understand the basic concept of biomass
- Analyze the wind energy

UNIT I: INTRODUCTION TO ENERGY SOURCES

World's reserve of Commercial energy sources and their availability-India's production and reserves-Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas – Applications - merits and demerits.

UNIT II: SOLAR THERMAL ENERGY

Solar constant -Solar Spectrum-Solar radiations outside earth's atmosphere –at the earth surface- on tilted surfaces -Solar Radiation Geometry-Basic Principles of Liquid flat plate collector –Materials for flat plate collector -Construction and working- Solar distillation–Solar disinfection - Solar Drying-Solar cooker (box type)-Solar water heating systems – Swimming pool heating.

UNIT III: PHOTOVOLTAIC AND ITS APPLICATIONS

Introduction-Photovoltaic Principle-Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells- Applications of solar photovoltaic systems - PV Powered fan – PV powered area - lighting system – A Hybrid System.

UNIT IV: BIOMASS ENERGY

Introduction-Biomass classification- Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant- floating and fixed dome type plant -advantages and disadvantage of -Bio-gas from plant wastes-Methods for obtaining energy from biomass- Thermal gasification of biomass.

UNIT V: WIND ENERGY

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage-- Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation

BOOKS FOR STUDY:

1. Kothari D.P., K.C. Singal and RakeshRanjan, Renewable energy sources and emerging Technologies, Prentice Hall of India, 2008.
2.Solar Energy-principles of thermal collection and storage-S.P. SUKHAME-tata- McGraw-Hill publishing company ltd.

BOOKS FOR REFERENCE:

1. Chetan Singh Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications, 2ndEdition, PHI Learning Private Limited, 2011.
2. Rai G. D, Non-conventional Energy sources, 4th Edition, Khanna Publishers,2010.
3. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
4. Kalogirou S.A., Solar Energy Engineering: Processes and Systems, 2nd Edition, Academic Press, 2013.
5. ZobaaA.F.and Ramesh Bansal, Handbook of Renewable Energy Technology, World Scientific, 2011.

WEB LINK:

https://archive.nptel.ac.in/courses/115/105/115105127/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5MBE1:1		ENERGY PHYSICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches (✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:56

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	06
4.	Global	52

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

LASER TECHNOLOGY AND ITS APPLICATION

Major Based Elective: I
Course Code: 22UPH5MBE1:2
Hours / Week: 5
Credit: 5

Semester: V
MaximumMarks: 100
Internal Marks : 25
External Marks: 75

OBJECTIVE:

- Student can able to understand laser technology and its applications.

COURSE OUTCOMES:

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

- Describe the fundamentals of light and their properties, Explain the basic principle of Laser emission
- Illustrate and explain the principles and design considerations of various lasers, Categorize modes of their operation.
- Describe the applications of laser in industries, Execute the obtained knowledge in various technology of applications of Lasers.
- Compare the different types of lasers, Check the work ethics and work place safety.
- Implement the significance of modern lasers in communication networking system. Develop the knowledge in production of laser of various types.

UNIT - I: FUNDAMENTALS OF LASER

Absorption and emission of light - spontaneous emission, stimulated emission - Einstein's relation - Condition for light amplification - Population inversion - Pumping methods - Active medium - Metastable states – Laser Beam characteristics.

UNIT - II: PRODUCTION OF LASER

Classification of LASERs - solid state Lasers - Ruby Laser - Nd:YAG Laser - Fiber Lasers – Gas Lasers - Helium - Neon Laser - Argon Laser - CO2 Laser - Tunable dye Lasers - Semiconductor Lasers.

UNIT – III: INDUSTRIAL APPLICATIONS OF LASER

Lasers in material processing - The surface treatments - Drilling - Cutting - Welding - Heat treating - Lasers in Electronics industry - Lasers in nuclear energy - Holography - Recording and reconstruction of hologram.

UNIT - IV: LASER IN COMMUNICATION

Optical data storage - Optic fiber communication - Types of optical fiber - Block diagram of Laser communication system - advantages of fiber optic communication - Optical computer - LASER Rangers - LIDAR.

UNIT - V: LASER IN MEDICINE

LASER in Medicine and Surgery - LASER in ophthalmology - LASER endoscopy - photocoagulation - LASER safety and hazard.

BOOKS FOR STUDY:

1. Avadhanulu M.N. Hemne P.S, An introduction to LASERS theory and applications. (Second Edition). S. Chand & Company, New Delhi, 2012.
2. N. SubrahmanyamBrijlal, M. N. Avadhanulu, A Textbook of OPTICS, 2008.

BOOKS FOR REFERENCE:

1. Nambiyar K.R. LASER: Principles, Types and Applications.2004.
2. S. Nagabhushana, N. Sathyanarayana. Lasers and optical instrumentation, Reprint. 2013.

WEB LINK:

1. https://www.eriesd.org/cms/lib/PA01001942/Centricity/Domain/691/Science-ResourceGuide.pdf
2. https://www.fisica.net/optica/Laser-and-its-Applications.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits	
V	22UPH5MBE1:1		LASER TECHNOLOGY AND ITS APPLICATION			5		5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:45

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	45

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

PHYSICS OF EARTH

Major Based Elective: I
Course Code: 22UPH5MBE1:3
Hours / Week: 5
Credit: 5

Semester: V
MaximumMarks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVE:

- To know about the earth system and geomechanics.

COURSE OUTCOMES:

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

- Envisage and frame the whole earth structure with its subsystem's atmosphere, biosphere, hydrosphere, lithosphere, mantle and core.
- Explore their physical characteristics and geological functions of macro earth in scientific method.
- Estimate the earth's age and temperature by applying the laws of thermodynamics
- Understand the gravity, electric and magnetic fields of the earth
- Predict the events like earthquake, landslide, Valona through geophysical techniques and to step to save life.

UNIT- I: THE EARTH SYSTEM

The scientific method - Geology as a science - Earth's shape and surface - Earth's density - The Mantle and core - The crust - The inner core Chemical Composition of Earth's Major Layers - The plate tectonic system - Continental drift - seafloor spreading - divergent Boundaries - Convergent Boundaries - Seismic Waves - measuring earthquakes - Exploring Earth's Interior with Seismic Waves - Layering and Composition of Earth's Interior.

UNIT- II: GEOTHERMICS AND GEOCHRONOLOGY

Geothermic: Earth's Internal Temperature: Heat flow through Earth's interior - Conduction through the Lithosphere - Convection through the Mantle and the Core - Temperature inside the Earth - Volcanism - Volcanoes and its types - Geochronology: Estimating the Earth's age - Cooling of the Sun - cooling of the Earth - Increase of the Earth - Moon separation - Oceanic salinity and Sedimentary accumulation.

UNIT - III: GEOMECHANICS

Kepler's Law of planetary motion - Orbital parameters - Earth's Size and Earth's shape - Gravitation: The law of universal gravitation - Gravitational acceleration - Gravitational potential - The Earth's Rotation: Centripetal and centrifugal acceleration - Changes in the earth rotation.

UNIT- IV: GEOELECTRICITY AND GEOMAGNETISM

Geoelectric: Electrical properties of the Earth - Electrical surveying - Natural potentials and currents - self potential - Telluric currents - Electrical conductivity in the Earth –Geodynamo - Geomagnetism: Introduction - The magnetic field of external origin - The magnetic field of internal origin.

UNIT - V: GROUND WATER AND CLIMATE SYSTEM

Components of the climate system: Atmosphere – hydrosphere – cryosphere - lithosphere and biosphere. The greenhouse effect: A Planet without Greenhouse Gases - Earth's Greenhouse Atmosphere - Geologic cycling of water - Hydrology of ground water - Hydrology and climate.

BOOKS FOR STUDY:

1. J.P. Grotzinger, "Understanding Earth", 7th Edition, W.H. Freeman and Company, 2014.
2. William Lowrie, "Fundamentals of Geophysics", 2nd Edition, Cambridge University Press, 2007.
3. J.S. Monroe, "Physical Geology", 6th Edition, Thomson Corporation, 2007.

BOOKS FOR REFERENCE:

1. F.D. Stacey, P.M. Davis, "Physics of the Earth", 4th Edition, Cambridge University Press, 2008.
2. A.E. Mussett, "Looking into the Earth", 1st Edition (2000), Cambridge University Press, Reprint 2009.

WEB LINK:

https://nptel.ac.in/courses/119106008

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	22UPH5MBE1:3		PHYSICS OF EARTH			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	57

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

NUMERICAL METHODS

Skill Based Elective: II
Course Code: 22UPH5SBE2:1
Hours / Week: 2
Credit: 2

Semester: V
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

On completion of the course,

- Develop the mathematical skills in the area of errors.
- Understand the numerical techniques to solve the linear equations.
- Understand various methods used to solve the physical problems.
- Explains Numerical Solution of ordinary differential equation
- Describes the concept of Numerical Integration

UNIT I: ERRORS

Errors of arithmetic and computation: Inherent errors, numerical errors, modeling errors, Blunders, Absolute and relative errors, Machine Epsilon - Error propagation - Conditioning and stability - Error estimation- Errors and approximation.

UNIT II:MATRIX AND LINEAR EQUATIONS

Introduction- system of linear equations- Gauss Elimination method-Gauss Seidal Iteration method-Gauss Jordan elimination method.

UNIT III: CURVE FITTING

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

UNIT IV: ITERATIVE METHODS

Solving non – linear equation – bisection method – Successive approximation – Newton Raphson method – modified Euler's method –Runge – Kutta method (second and third orders only)

UNIT V: NUMERICAL INTEGRATION

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

BOOKS FOR STUDY AND REFERENCE:

1. Introductory methods of numerical analysis – S.S. Sastry, Prentice Hall of India, New Delhi (2000)
2. Numerical methods – A. Singaravelu, Meenakshi Agency, Chennai (2001).
3. Numerical method in Science and Engineering – M.K. Venkataraman, PHI –New Delhi (1997)
4. Mechanics and Mathematical methods, R. Murugesan, S. Chand & Co, NewDelhi (1999)
5. Numerical methods by P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
V	22UPH5SBE2:1	NUMERICAL METHODS	2	2

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	
CO2	✓		✓			✓				
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches() = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:31

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	31

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

INTRODUCTION TO COMPUTATIONAL PHYSICS

Skill Based Elective: II
Course Code: 22UPH5SBE2:2
Hours / Week: 2
Credit: 2

Semester: V
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- Overview and advanced study of numerical methods
- To Learning basic methods, tools and techniques of computational physics
- Developing practical computational problem-solving skills

COURSE OUTCOMES:

- On completion of the course the students will be able to understand
- Students will able computational tools can be MATLAB functions-operators
- Students will able to learning the different types of errors Analysis.

UNITI: NEEDOFCOMPUTATIONALTOOLS

Basic computer architecture and latest advancements - Introduction to MATLAB - MATLAB Features -Desktop windows-MATLAB help and demos - MATLAB Functions-operators and Commands-saving and Loading data.

UNIT– II: ERRORANALYSIS

Need for error analysis-Definition of error- Absolute error- Relative error- Precision- Addition - Subtraction -Multiplication - Division - Error in numerical methods - Truncation error – Round off Errors - Error propagation in arithmetic operations.

UNIT–III: MATLABANDDATAVISUALIZATION

Creation of arrays and matrices - Arithmetic Operations– Saving and Restoring- - Solution of simultaneous equations-MATLAB plot module – Import export data - Plotting graphs-1D plot –2D plot – mesh– surf– 3D plots.

UNIT–IV: NUMERICALMETHODSUSINGMATLAB

Roots of algebraic and transcendental equations – bisection method, Newton Raphson method-solution of simultaneous linear equations by Gauss elimination methods-Interpolation

UNIT–V:-APPLICATIONS IN PHYSICSUSINGMATLAB

Calculate time period using Simple Pendulum -Verify Hooke's Law - Falling object in one dimension - Two-dimensional motion- Projectile motion - V-I Characteristics of Junction and Zener diode.

BOOKS FOR STUDY:

1.AmosGilat, MATLABAnintroductionwithApplications, JohnWiley&SonsPublisher, 4th Edition, 2007
2.KincaidD.andChenneyW, Numerical Analysis:MathematicsofScientific Computing, AMS, UniversityPress,Hyderabad,Ist Edition, 2009
3.RizwannButt, Introduction to NumericalAnalysisusingMATLAB, Jones Publisher, Ist Edition, 2008

4.SastryS.S, IntroductoryMethodsofNumericalAnalysis, PrenticeHallof India Publisher, 4th Edition, 2005

BOOKS FOR REFERENCE:

1.JoelFranklin, Computational Methodsfor Physics, UniversityCambridgePress, 1st Edition, 2018
2.Gupta, AgarwalandVarshney Design and AnalysisofAlgorithms, PHILearningPublisher,2nd Edition, 2008

WEB LINK:

https://www.mathworks.com/help/thingspeak/visualize-data.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
I	22UPH5SBE2:2	INTRODUCTION TO COMPUTATIONALPHYSICS	2	2

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:44

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	44

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTRICAL APPLIANCES

Skill Based Elective: III
Course Code: 22UPH5SBE3:1
Hours / Week: 2
Credit: 2

Semester: V
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

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

- Understand the knowledge of the home electrical appliances in everyday life,
- Develop the skill in electronic equipments
- Understand the trouble shoot electrical circuits.
- Needs a basic knowledge in electricity and the learners are expected to gain more knowledge for AC and DC
- Understand the operations and safety handling of certain commonly used domestic appliances

UNIT I

Physics behind Home appliances – Light bulb – Fan – Hair drier – Television – Air Conditioners – microwave ovens – Vacuum cleaners – Dishwasher – Washing machines

UNIT II

How things work – Basic principles – Tape recorder – Taps – Lifts – Submarines – Jet planes – Helicopters – Rockets – fax machines – Pagers – Cellular phones

UNIT III

Demonstration – making a switch board with multiple points – wiring – one lamp controlled by one switch/Two switches – fixing a fuse – soldering – P.C.B Preparation

UNIT IV

Study of resistors, chokes, Capacitors and Transformers – multimeter – Basic principles – measurement of resistance, Voltage AC & DC

UNIT V

Servicingof domestic appliances – ironbox – mixer – grinder – motor – emergency lamp

Books for Study

1. The Learner's series – Everyday science – Published by INFINITY BOOKS, New Delhi
2. The Hindu speaks on Science, Vol I & II, KasturiRanga Publishers, Chennai

Books for Reference

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley, New York (2001).
2. Physics, Vols I, II, III by D.Halliday, R.Resnick and K.S.Krane, 4th Edition, Wiley, New York (1994).
3. The Feymann Lectures on Physics Vols I, II, III by R.P. Feynmann, R.B. Leighton & M. Sands, Narosa, New Delhi (1998).

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
V	22UPH5SBE3:1	ELECTRICAL APPLIANCES	2	2

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓				
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches() = 42, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:40

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	6
2.	Regional	6
3.	National	6
4.	Global	40

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

MEDICAL PHYSICS

Major Based Elective: II
Course Code: 22UPH5SBE3:2
Hours / Week: 2
Credit: 2

Semester: VI
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- Application of physical concepts and methods to the understanding of human body in health and diseases.
- Ensuring the availability and use of resources of physics in day –to –day medical practice
- At the end of the course the student must have an in-depth knowledge in the field of Medical Physics.

COURSE OUTCOMES:

On completion of the course the students will able to understand

- Demonstrate understanding of human body in health and disease applied to medicine.
- Apply the interaction of Medical Instrumentation knowledge.
- Learn the Basic concepts of Lasers in Medicine in radiation therapy.
- Different types of medical techniques treatment.
- Know about to select appropriate monitoring Ultrasound instrumentation for survey and protection purpose

UNIT-I: MECHANICS OF HUMANBODY

Static, Dynamic and Frictional forces in the Body –Composition, properties and functions ofBone – Heat and Temperature – Temperature scales –Clinical thermometer –thermography –Heattherapy.

UNIT-II: MEDICALINSTRUMENTATION

Measurements of Non electrical parameters-Respiration-heart rate-temperature-blood Pressure-Electrical activity of the heart-effect of electrified on cardiacmusclesstimulation laws-Arhythmias its detection-principles of Electrocardiography.

UNIT-III: LASERS IN MEDICINE

Introduction to laser-principle and production of laser- effects of laser radiation ontissues, Different types of lasers- photo thermal effects, photochemical effects –photodynamic therapy, Laser Applications in therapy and diagnosis-opthalmology.

UNIT-IV:MEDICAL IMAGING TECHNIQUES

X-rayimaging-propertiesofX-rays-ProductionofX-rays-PlanarX-rayimaging-instrumentation-γ-rayimaging-principle and working crystalscintillation camera (gamma camera) Magnetic resonance imaging.

UNIT-V: ULTRASOUNDIMAGING

Ultrasoundimaging-generationanddetectionofultrasound-Properties-reflection-Transmission- attenuation-Ultrasound Transducers, Ultrasound instrumentation Mechanical and electronic probes-probes for external and internal use.

BOOKS FOR STUDY

1. J.R.CameronandJ.GSkofonick, Medical Physics,JohnWiley &Sons Publishers,1st Edition,1978
2. R. WWayanant, LasersinMedicine, Plenum Publishers,1st Edition,2001.
3. S. Webb, The physics of medical imaging, Hilger Publishers,2st Edition,1998.
4. S. AtheenaMilagiPandian, Biomedical Engineering, Amazon, Publishers,1st Edition,2019

BOOKS FOR REFERENCE:

1. O.Glasser, Medical PhysicsVolume1-3, ChicagoPublishers,2nd Edition, 1946
2. LeslieCromwell, BiomedicalInstrumentation and measurement, PrenticeHallofIndiaPublishers, 2nd Edition, 1999
3. John G.Webster, MedicalInstrumentationApplicationandDesign John Wileyandsons, Publishers, 3rd Edition, 1998

WEB LINK:

https://www.ncbi.nlm.nih.gov/pmc

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	22UPH5SBE3:2		MEDICAL PHYSICS			2			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:41

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	41

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

QUANTUM MECHANICS

Core Course: VIII
Course Code: 22UPH6CC8
Hours / Week: 6
Credit: 6

Semester: VI
Max. Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand about the basics of classical and quantum ideas
- To explain photoelectric effect with experiments
- To differentiate the Hamilton's equation from the Langrage's equation

COURSE OUTCOMES:

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

- Understand the Lagrangian formalism
- Know the concept of Hamiltonian formalism
- Understand the Photo electric effects
- Describe the Dual nature of matter
- Explore the concept of Schrodinger's wave mechanics

UNIT I: LAGRANGIAN FORMALISM

Mechanics for a system of particle – Constraints – Generalized co-ordinates – Transformation equations – Configuration space – Principle of virtue work – D' Alembert's principle – Lagrange's Equation – Applicationsof Lagrange's equation – Atwood machine – Simple pendulum.

UNIT II: HAMILTONIAN FORMALISM

Hamilton equations - Phase space – Generalized momentum – Cyclic co-ordinates – Conservation theorem for generalized momentum – Conservation theorem for energy.

UNIT III: PHOTO ELECTRIC EFFECTS

Photo electric effect – Lenard, Richardson and Compton experiments – Laws of photoelectric emission – Einstein's photoelectric equation – Millikan's experiment - Determination of Planck's constant – Photo emissive cell – Photo – voltaic cell – Photo conductive cell – Photo multiplier.

UNIT IV: DUAL NATURE OF MATTER

De Broglie concept of matter waves – De Broglie wavelength – Wave velocity and group velocity for the De Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomon's experiment for verifying De Broglie relation – Heisenberg's uncertainty principle.

UNIT V: SCHRODINGER'S WAVE MECHANICS

Basic postulates of wave mechanics – Development of Schrodinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function - Eigen function and eigen values – Applications of Schrodinger equation – Particle in a box - Linear harmonic oscillator – The barrier penetration problem.

BOOKS FOR STUDY:

1. S.L. Gupta, V. Kumar & H.V. Sharma, Classical Mechanics, PragatiPrakashan, Meerut, 2010 (Unit I & II).
2. R. Murugesan, Modern Physics, 17th Edition, S. Chand Pvt. Ltd., New Delhi, 2013 (Unit III, IV & V).

BOOKS FOR REFERENCE:

1. H. Goldstein, Classical Mechanics, Addison Wesley, London, 2002.
2. P.M. Mathews &K.Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill, New Delhi, 37th Reprint, 2007.
3. Gupta, Kumar & Sharma, Quantum Mechanics, 23rd Edition, 2003-2004.
4. Satyaprakash, Quantum Mechanics, PragatiPrakashan.
5. L.I. Schiff, Quantum Mechanics, McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2010.

WEB LINK:

https://nptel.ac.in/courses/115106066

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	22UPH6CC8		QUANTUM MECHANICS			6			6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓		✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 44

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	44

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MATERIALS SCIENCE

Core Course: IX
Course Code: 22UPH6CC9
Hours / Week: 6
Credit: 6

Semester: VI
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand about the Fundamentals of Material science
- To know about the properties of materials.

COURSE OUTCOMES:

On completion of the course the students will

- Analyze the ideas of Material science
- Knowledge about Phase diagram and transformation.
- Understanding on the basics of vacuum and oxidation
- Analyze the working of NDT
- Learn Basic ideas about electrical and magnetic properties of materials

UNIT – I : MATERIALS SCIENCE

Classification of materials – Properties of Engineering materials – Materials Structure – Types of Bonds – Bonds Formation – Ionic Bond – Covalent Bond – Metallic Bond – Comparison of Bonds – Secondary Bonds.

UNIT – II : PHASE DIAGRAM AND TRANSFORMATION

Basic terms – Solid Solution – Hume – Rothery's rule – Intermediate Phase – Phase Diagrams – Gibb's Phase Rule – Time – Temperature cooling curves – Construction of Phase Diagrams – The Lever Rule – Equilibrium Binary System – Eutectic System – Mechanism of Phase Transformation.

UNIT – III : VACUUM AND OXIDATION

History of vacuum technology – units of Vaccum – Kinetic aspects of Gases – Application of Vaccum – Gas flow in vaccum systems – production of vaccum – Measurement of vaccum – Thermal conductivity gauges – Penning Gauge – Oxidation – Oxidation Resistant Materials.

UNIT – IV : NON-DESTRUCTIVE TESTING (NDT)

NDT and its advantages – Defects in materials – Selection of the NDT Method – Visual Inspection – Basic Principle – Liquid Penetration Testing – Physical Principle – Magnetic Particle Testing (MPT) – Principle of MPT – Sensitivity – Limitation – Eddy Current Testing (ECT) – Principle – Instrument for ECT – Applications – Limitations – Radiography – Basic Principle – Applications– Limitations.

UNIT – V : ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

Dielectrics – Polarization – Temperature and frequency effects – Electric Breakdown – Ferroelectric materials – Electrostriction – Piezoelectricity – Uses of Dielectrics – Magnetic Properties – Classification – Magnetostriction – Soft and Hard Magnetic Materials.

BOOKS FOR STUDY:

1. Materials Science by G.K.Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill Publishing, 1994.
2. Materials Science and Engineering by V. Raghavan, Prentice Hall of India, 2004.

BOOKS FOR REFERENCE:

1. Practical Non-Destructive Testing by Baldevraj,T. Jayakumar, M. Thanvasimuthu, Narosa Publishing House, Chennai, 2002.
2. Testing of Metallic Materials by A.V.K. Suryanarayana, B.S. Publications, Giriraj lane, Sultan Bazar, Hyderabad – 95, 2003.

WEB LINK:
https://nptel.ac.in/courses/112108150

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	22UPH6CC9		MATERIALS SCIENCE			6			6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓			✓	✓			✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓	✓	✓	✓	✓	
Number of Matches(✓) = 42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:65

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	65

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

CORE PRACTICAL IV

Core Practical – IV
Course Code: 22UPH6CP4
Hours / Week: 5
Credit: 4

Semester: VI
Maximum Marks: 100
Internal Marks: 40
External Marks : 60

COURSE OUTCOMES:

On the completion of this course the student will be able to design

- Understand the working of single stage RC coupled transistor amplifier, analog circuits using multivibrator
- Study the logic gates and verify their truth tables
- Analyse the theorems
- Know the simple arithmetic operations using Intel 8085 Microprocessor
- Learn the sorting and block transfer of data, carrying arithmetic operations using microprocessor Intel 8085 and encode binary data in BCD code

Section – A – Electronics

Any **EIGHT** experiments only

1. Construct the Regulated power supply using Zener and calculate the Percentage of regulation.
2. Construct the Single stage – RC coupled amplifier usingTransistor.
3. Study the Frequency response of Emitter follower amplifier.
4. Construct and study the operation of Astablemultivibrator.
5. Construct and study the operation of Monostablemultivibrator.
7. Construct Logic gates – AND, OR and NOT gates using discrete components verify its Truth table.
8. Study the performance of Universal gates NAND/NOR and basic gates from Universal gates.
9. Construct Half Adder and Full Adder using logic gates
10. Construct and study Half Subtractor and Full Subtractor using logic gates.
11. Study the operation of BCD to 7 segment decoder – 7 segment LED display.
12. Prove the DE Morgan's theorem and Boolean algebra using gates.
13. Construct the Flip flop using gates and verify its Truth Table.
14. Construct and study the operation of power amplifier.

Section –B – Microprocessor 8085& 'C' Programming

Any **FOUR** experiments only

15. Solve 8-bit addition and 8-bit subtraction using 8085 microprocessor kit.
16. Perform 8-bit multiplication and divisionusing 8085 microprocessor kit.
17. Conversion from decimal to hexadecimal systemusing 8085 microprocessor kit.
18. Conversion from hexadecimal to decimal systemusing 8085 microprocessor kit.
19. Solve the given problem of Simpson's rule using C Programming.
20. Find the solution of TrapezoidalruleC Programming.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Subject Code	Title of the Course				Hours			Credits	
VI	22UPH6CP6	CORE PRACTICAL VI				5			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:20

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	20

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MICROPROCESSOR FUNDAMENTALS

Major Based Elective: II
Course Code: 22UPH6MBE2:1
Hours / Week: 6
Credit: 6

Semester: VI
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand the hardware components and software programming instructions of INTEL 8085 microprocessor and 8051 microcontrollers
- To understand the concept of interfacing and peripheral devices

COURSE OUTCOMES:

On completion of the course the students will have:

- Know the basic ideas on microprocessor, memory and I/O devices
- Learn the arithmetic programs
- Familiar with the basic concepts of microprocessor interfacing
- Understand the programme peripheral interface and instructions
- Acquire skills in the programming instruction sets of microprocessors

UNIT 1: ARCHITECTURE

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 –Pin out diagram – Functions of different pins.

UNIT 2: PROGRAMMING TECHNIQUES

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest(single byte),

UNIT 3: INTERFACING MEMORY TO 8085

Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOVRd, Rs – MVI Rd,data(8)) . Memory mapped I/O scheme – I/O mapped I/O scheme.

UNIT 4: INTERFACING I/O PORTS TO 8085 & INTERRUPTS

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255– flashing LEDs. Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions –priorities – simple polled and interrupt-controlled data transfer.

UNIT 5: MICROPROCESSOR 8086

Intel 8086 microprocessor: Introduction – Architecture - Pin configuration- Operating modes: Minimum mode, Maximum mode. Memory addressing: 8-bit data from even and odd address bank, 16-bit data from even and odd address bank. Addressing modes. Interrupts: Hardware interrupts – Software interrupts –Interrupt priorities. Simple programs- addition –subtration.

BOOKS OF STUDY

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

BOOKS FOR REFERENCE:

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

WEB LINK:

https://nptel.ac.in/courses/108105102

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits	
VI	22UPH6MBE2:1		MICROPROCESSOR FUNDAMENTALS			6		6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:32

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	32

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ASTROPHYSICSAND COSMOLOGY

Major Based Elective: II
Course Code: 22UPH6MBE2:2
Hours / Week: 6
Credit: 6

Semester: VI
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand the basic ideas astrophysics and cosmology
- To investigate and describe the interrelationships between the Earth, Moon and Sun
- Explain the lifecycle of a star

COURSE OUTCOMES:

On completion of the course the students will able to understand

- Basic information about the formation of stars, their magnitudes and luminosity
- Study of distances of stars, stellar mass and temperature
- Knowledge of astronomical instrument, telescopes, its mountings and image defects
- Students will analyse the structure galactic and extragalactic astronomy.
- The basic skill of cosmology

UNITI:INTRODUCTORYASTRONOMY

HistoryofAstronomy-Overviewofthemajorconstituentsoftheuniverse-SolarSystem-Planets -lawsofmotionofplanets-innerplanets-outerplanets-Extrasolarplanets-Methodsofdetection ofextrasolar planets-Black bodyradiation-specificintensity-luminosity

UNITII:STELLARASTRONOMY

Measurement of stellar Parameters: Stars-general Distances to stars - trigonometric parallax;Stellarbrightness–luminosity-flux-apparentmagnitude-magnitudesystem-distancemodulus-colourindex-extinction-colourtemperature-effectivetemperature-spectralclassificationofstars.Stellar structure: Equation of Hydrostatic equilibrium - Bounds on Pressure and temperature ionstars.

UNITIII:EVOLUTIONOFSTARS

StellarEvolution:GeneralideaofMainsequence.Quantitativediscussiononevolutionawayfrom Mainsequence.EndStageofStars: WhiteDwarfs,Neutron stars- EstimatingtheirMassradiirelation.Binarystars: -visual binary,eclipsingbinary-spectroscopic binary

UNITIV:GALACTICAND EXTRAGALACTICASTRONOMY

Milkyway-Hubbleclassificationofgalaxies-SpiralGalaxies-EllipticalGalaxies-Irregulargalaxies-DwarfGalaxies-Massesofgalaxies-Rotationcurvesofgalaxies-Darkmatter.Groupsandclusters of galaxies-Interactinggalaxies-

UNITV:COSMOLOGY

StandardCandles(CepheidsandSNeType1a),CosmicDistance Ladder, ObersParadox,HubbleExpansion, Cosmological Principle, Newtonian Cosmology

BOOKS FOR STUDY

1. ShuF,The physical universe,UnivScienceBook,1st Edition, 1982
2. BradleyW.Carroll&DaleA. Ostlie, An introductiontoModern Astrophysics, Pearson, 2nd Edition 2006
3. IGNOU.Basics of Astronomy - IGNOU course book PHE-15 Astronomy and Astrophysics, NeerajPublications, 1st Edition, 2006

BOOKS FOR REFERENCE:

1. HarwitM.Astrophysical concepts, SpringerPublisher, 2nd Edition, 2000.
2. G. B.Rybicki&Lightman A. P. Radiative processes in Astrophysics, Wiley-VCH Publisher, 2nd Edition, 1986.

WEB LINK:

https://www.e-education.psu.edu/astro801/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	22UPH6MBE2:2		ASTROPHYSICS AND COSMOLOGY			6			6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:51

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	00
2.	Regional	00
3.	National	00
4.	Global	51

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

COMMUNICATION PHYSICS

Major Based Elective: III
Course Code: 22UPH6MBE2:3
Hours / Week: 6
Credit: 6

Semester: VI
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVE:

- To promote scientific temper among students and update the basic functioning of various communication systems.

COURSE OUTCOMES:

On completion of the course the students will be able to

- Understand the Concept of Radio and Transmission and Reception.
- To know the function of Fiber optic communication
- Understanding Radar communication techniques.
- Learn the working principle of satellite communication system
- Learn the mobile communication concepts.

UNIT I: RADIO TRANSMISSION AND RECEPTION

Transmitter-modulation-need for modulation- types of modulation amplitude, frequency and phase modulation- modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter. Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver.

UNIT II: FIBER OPTIC COMMUNICATION

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

UNIT III: RADAR COMMUNICATION

Basic radar system -Radar range –Antenna scanning – Pulsed radar system – A Scope- Plan 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 communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

UNIT V: MOBILE COMMUNICATION

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – Applications – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) – Wi-Fi - 3G (Basic ideas only).

BOOKS FOR STUDY:

1. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S. Chand & Company PVT. Ltd., 2013. 3. Mani I. P., A text book of Engineering Physics, Dhanam Publications, Chennai42, 2014.

BOOKS FOR REFERENCE:

1. PoornimaThangam I, Satellite communication, Charulatha Publications, 2012.
2. Dennis Roddy and John Coolen, Electronic Communication, PHI, 1990.
3. William C.Y. lee, Cellular telecommunication (second edition), Tata Mcgraw hill, 1991

WEB LINK:

https://nptel.ac.in/courses/117102059

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	22UPH6MBE2:3		COMMUNICATION PHYSICS			6			6	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:69

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	69

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

DIGITAL AND COMMUNICATION ELECTRONICS

Major Based Elective: III
Course Code: 22UPH6MBE3:2
Hours / Week: 6
Credit: 6

Semester: VI
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVE:

- To study various number systems, logical circuits and their implementation.

COURSE OUTCOMES:

On completion of the course the students will be able to

- Understand the structure of various number system and basic logic gates.
- Construct sequential circuits and to design counters.
- Understanding AM, FM and PM modulation and demodulation techniques
- Learn the working principle of satellite communication system
- Learn the basic concepts of fiber optics and types of fiber

UNIT I: DIGITAL FUNDAMENTALS

Number Systems and Conversions - BCD Code - Gray code - 1's and 2's complements – Basic logic gates - NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks - Laws and theorems of Boolean algebra –- NAND-NAND circuits - Karnaugh's map- SOP and POS- Applications.

UNIT II : SEQUENTIAL LOGIC

RS, Clocked RS, D, J-K and J-K Master-Slave Flip-flop - Shift registers and Counters- Multiplexers and Demultiplexers – Decoders and Encoders - Memory Circuits -D/A and A/D converters

UNIT III: MODULATION AND DEMODULATION

Amplitude modulation - Frequency modulation, Phase Modulation and Pulse Width Modulation - Detectors of AM, FM, PM and PWM, PLL - Noise in Communication Systems

UNIT IV: DIGITAL AND SATELLITE COMMUNICATION

ASK, FSK, PSK Modulation and Demodulation, Advantages and disadvantages of digital communication. Communication Satellite Systems - Telemetry - Tracking and Command System - Satellite Links - Commonly Used frequency in Satellite Communication - Multiple access - Error Detection.

UNIT V: FIBRE OPTIC COMMUNICATION

Basic Fiber Optic System - Advantages of Fiber Optic System - Propagation of light through fiber - Numerical aperture - Acceptance angle - Losses and distortion in optical fibers - Basic fiber Optical communication and links - Special Applications.

BOOKS FOR STUDY:

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4thEdition (1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi (1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printersand Publishers) Pvt. Ltd., Chennai (2005).

BOOKS FOR REFERENCE:

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGrawHill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New AgeInternational (P)

Ltd. (2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, NewDelhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi(2001)

WEB LINK:
https://nptel.ac.in/courses/108105113

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
VI	22UPH6MBE3:2	DIGITAL AND COMMUNICATION ELECTRONICS	6	6

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:54

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	54

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

OPTO ELECTRONICS AND FIBER OPTIC COMMUNICATION

Major based elective: III
Course Code: 22UPH6MBE3:3
Hours / Week: 6
Credit: 6

Semester: VI
Max. Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand the salient features of optical absorption in metals, semiconductors and insulators
- To know about the characteristics of the opto electronic materials
- To study about the different types of optical data storage device

COURSE OUTCOMES:

On completion of the course the students will be able to understand

- Interaction of light with matter
- Learning the different types of optoelectronic materials and devices
- Different types of Laser
- The basics of fiber optic communication
- Optical data storage.

UNIT I: INTERACTION OF LIGHT WITH MATTER

Introduction - Optical constants - Basic principle - Extinction coefficient - Absorption coefficient - Reflectivity and Transmissivity - Light absorption in metals, semiconductors – Excitons - Salient features of optical absorption in metals, semiconductors and insulators.

UNIT II: OPTO ELECTRONIC MATERIALS AND DEVICES

Optoelectronic materials – Characteristics - Liquid crystal display - Types of display - Light emitting diode - LED materials - LED displays.

Photo detectors: Photo conductor - Photo diode - Photo transistor - Solar cell and its Applications..

UNIT III: TYPES AND APPLICATIONS OF LASER

Basic ideas of Lasers - Stimulated emission and radiation – Population inversion - Types of Lasers: Ruby Laser – Helium-Neon Laser - CO_2 Laser – Semiconductor Laser– Nd: YAG Laser – Applicationsof Laser.

UNIT IV: FIBER OPTIC COMMUNICATION

Introduction - Principle of Optical Fiber - Propagation of optical signal through fiber - Acceptance angle - Numerical aperture - Single and multi mode fibers - Characteristics of step index and graded index fibers - Light source: Laser diode - Light detectors: Avalanche photo diode - Optical fiber communication link (block diagram) -Advantages of fiber optics communication.

UNIT V: OPTICAL DATA STORAGE

Surface storage - Phase change recording - Magneto optical data storage - Hi-tech evolved in system development –Automatic focusing - Automatic track following capacity of CD - Advantages of CD – Holographic storage -Construction and reconstruction of a Hologram.

BOOKS FOR STUDY:

1. S. Jayakumar, Material Science, R.K Publishers, Coimbatore, 2005(Unit I to III).
2. A. Marikani, Engineering Physics, PHI Learning Private Limited, New Delhi, 2nd Edition, 2013 (Unit IV).
3. P.K. Palanisamy, Semiconductor Physics and Opto Electronics, Scitech Publications, 2003(Unit V).

BOOKS FOR REFERENCES:

1. M.N. Avadhanulu, An introduction to Lasers theory and Applications, S.Chand Publication, 1st edition, 2011.
2. B.B. Laud, Laser and non-linear optics, New age International Publishers, 2nd Edition, 1992.

WEB LINK:

https://nptel.ac.in/courses/108106167

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
VI	22UPH6MBE3:3	OPTO ELECTRONICS AND FIBER OPTIC COMMUNICATION	6	6

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:49

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	49

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

SEMESTER – I

ALLIED PHYSICS – I

PROPERTIES OF MATTER, THERMAL PHYSICS AND OPTICS

Course: I | Semester: I
Course Code: 22UPH1AC1 | Maximum Marks : 100
Hours / Week: 3 | Internal Marks : 25
Credit: 3 | External Marks : 75

Course Outcomes:

After successfully completing this course the student will be able to carry out the

- The principles of stress and strain set up in materials and to determine the various coefficients of elasticity.
- Flow of liquids due to viscous forces and the laws governing them as well as experimental ways of their determination.
- Transmission of heat due to process of conduction, convection and radiation and various laws involved in heat transformation.
- Various thermodynamic laws and the concept of entropy.
- The phenomenon like interference and diffraction, optical activity of liquids and its uses.

UNIT I: Properties of Matter

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

UNIT II: Viscosity

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

UNIT III: Conduction, Convection and Radiation

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling –Specific heat capacity of a liquid by cooling – thermal conduction –coefficient of thermal conductivity by Lee's disc method – Forbes' method for good conductor– Stefan's law of radiation. (No derivations).

UNIT IV: Thermodynamics

Basic concept of thermodynamics - thermodynamic system - Zeroth and I Law of thermodynamics – Applications – II law of thermodynamics -internal energy – Carnot's engine and Carnot's cycle – Applications - Efficiency of a Carnot's engine – Entropy –TS-diagram– heat engine- steam engine - Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.

UNIT V: Optics

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

Text Books:

1. Properties of matter – Brijlal and Subramanyam – Eurasia Publishing co., New Delhi, III

Edition 1983

2. Element of properties of matter – D.S.Mathur – S.Chand& Company Ltd, New Delhi, 10th

Edition 1976

3. Heat and Thermodynamics–Brijlal&Subramanyam, S.Chand& Co, 16th Edition 2005

4. Heat and Thermodynamics – D.S. Mathur, SultanChand& Sons, 5th Edition 2014.

5. Optics and Spectroscopy –R.Murugeshan, S.Chand and co., New Delhi, 6th Edition 2008.

6. A text book of Optics – Subramanyam and Brijlal, S. Chand and co.. New Delhi, 22nd Edition

2004.

7. Optics – Sathyaprakash, RatanPrakashanMandhir, New Delhi, VIIth Edition 1990.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course					Hours	Credits	
I	20UPH1AC1		PROPERTIES OF					3	3	
Course	Programme Outcomes					Programme Specific Outcomes				
Outcomes	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) =38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:62

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	62

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ALLIED PHYSICS PRACTICAL

Allied Course: II (Practical) Semester: II
Course Code: 22UPH2AP1 Maximum Marks : 100
Hours / Week: 3 Internal Marks : 40
Credit: 3 External Marks : 60

Course Outcomes:

After successfully completing this course the student will be able to carry out the

- Know the constitution of matter, the microscopic and macroscopic properties they possess.
- Understand viscous properties of liquids.
- Find the current and voltage sensitivities of a spot galvanometer and calibrate a high range voltmeter.
- Know the wavelengths of light ray components semiconductors.
- Study the logic gates and verify their truth tables.

ALLIED PHYSICS – II (PRACTICAL)

(Any twelve)

1. Non-Uniform Bending – Pin and Microscope method.
2. Sonometer – Verification of laws of transverse vibrations.
3. Specific heat capacity of a liquid – Newton's law of cooling method.
4. Thermal conductivity of a bad conductor – Lee's disc method.
5. Meter Bridge – Specific resistance of a material of a coil.
6. Newton's Rings – Determination of Radius of Curvature(R).
7. Spectrometer – Refractive Index (μ) of solid prism.
8. Spectrometer - Determination of wavelength using Grating.
9. Characteristics of Junction Diode.
10. Characteristics of Zener Diode.
11. Co-efficient of Viscosity a liquid- Poiseuille's method.
12. Surface Tension and Interfacial Tension of a liquid - Drop Weight method.
13. Construction of Full Wave Rectifier.
14. Study of Logic Gates - discrete components.
15. Potentiometer measurement of current.
16. Potentiometer measurement of resistance.
17. Surface tension- capillary rise method.
18. Figure of Merit-B.G.

References

1. Srinivasan M.N., Balasubramanian S. & Renganathan R., A Text book of Practical Physics, Sulthan Chand & Sons, New Delhi, 2000.
2. Somasundram S., Practical Physics, Apsara Publications, Tiruchirappalli, 2012.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	20UPH2AP1		ALLIED PHYSICS – II			3			3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =47 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:18

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	18

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

SEMESTER – III

ALLIED PHYSICS – II

ELECTRICITY, ELECTRONICS, ATOMIC AND NUCLEAR PHYSICS

Allied Course: II
Course Code: 22UPH2AC2
Hours / Week: 3
Credit: 2

Semester: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

Course Outcomes:

After successfully completing this course the student will be able to carry out the

- Amount of current that can pass through a conductor using ohms law and its applications,
- Effect of magnetic field due to current and concept of resonant frequency in tuning circuits,
- Atom models and how energy can be released in nuclear fission and fusion processes,
- Construction of a rectifier, amplifiers and oscillator,
- Basic digital electronics principles through logic gates and the laws governing them.

Unit I: Current Electricity

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

Unit II: Electromagnetism

Electromagnetic Induction –Electromagnetic force – Faraday's laws – Lenz law – Self Inductance – Mutual Inductanc Coefficient of CouplingA.C. Circuits – Mean value – RMS value – Peak value – LCR in series and parallel circuit – impedance – Q Factors-resonant frequency – sharpness of resonance.

Unit III: Atomic and Nuclear Physics

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

Unit IV: Analog Electronics

Semiconductor – Type of diode – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply. Transistor -Type of transistor – Working of a transistor – CE Configuration – current gain relationship between α and β – Transistor Characteristics – CE Configuration only– CE amplifier – feedback – Hartley oscillator – Colpitt's oscillator.

UNIT V: Digital Electronics

Number system – Decimal – Binary – Octal and Hexadecimal system – Double Dabble method – Binary addition, subtraction and multiplication-1's Compliment -2's ComplimentAddition – conversion of one number system to another number system - Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Books for Study and Reference:

1. Electricity and Magnetism – R. Murugesan, S. chand& co, 2001.
2. Modern Physics – R. Murugesan, S. chand& co, 1998.
3. Basic Electronics – B.L. Theraja, S. chand& co, 2003.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits	
I	20UPH2AC2		ALLIED PHYSICS – III			3		2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓	✓		✓	✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 69

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	69

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

Applied Physics for Computer Science

Semester: III **18UPH3AC3**

APPLIED PHYSICS-I

Objectives:

- To have a knowledge about the alternating current and its components
- To know about the number systems and the semiconductor memories
- To acquire knowledge about Boolean algebra, arithmetic and combinational logic circuits.

Unit I: Current Electricity

Ohm's Law - Limitations - Verification of Ohm's Law - SI units - Applications - Kirchoff's law - Applications of Kirchoff's law - Wheatstone's bridge - Metre bridge - Carey Foster's bridge - Potentiometer Measurement of Current and Resistance - Calibration of low range Voltmeter - Application- High Range Voltmeter – Applications.

Unit II: Alternating Current

AC circuits with double components - Measurement of current and voltage - Power in an AC circuit - Power factor (derivation) - Wattles current - Choke - Resonant Circuits - Series and parallel resonant circuits - Impedance - Q factor - Selectivity and Sharpness of resonance.

Unit III: Number Systems, Codes and Logic gates

Introduction - Analogue Vs Digital - Number Systems - Conversions - Binary: Addition, Subtraction, Multiplication, Division - 8421 Code - BCD Code - Excess 3 code - Gray code - Binary to Gray and Gray to Binary Conversion - ASCII code - Basic and Derivative Gates: AND, OR, NOT, NAND, NOR, EX-OR - NAND & NOR as Universal Gates.

Unit IV: Boolean algebra, Arithmetic and Combinational Logic Circuits

Introduction -Basic laws of Boolean algebra - Terms in Boolean Expression - De Morgan's theorem - Verification of Boolean expression using Boolean laws - Half-adder - Full adder - Half-Subtractor - Full Subtractor (using basic gates) - Encoder - Decimal to BCD encoder - Decoder - BCD to decimal decoder.

Unit V: Semiconductor Memories

Introduction - Types of semiconductor memories - ROM using diodes and transistors - ROM in terms of digital circuits - Building memory of larger capacity - PROM - EPROM - EEPROM - ROM as a unit in microcomputers - RAM - Static RAM - Flip Flop as a RAM cell - Memory expansion and Memory Parameters.

Books for study:

1. Brijlal & Subramanian, Electricity and Magnetism, Ratan Prakashan Mandir, 1995. (Unit I & II)
2. Puri V.K., Digital Electronics circuits and systems, Tata Mc Graw Hill publications, New Delhi, 2011. (Unit III, IV & V)

References

1. Narayanamurthi and Nagarathinam, Electricity and Magnetism, The National Publishing Company, Madras, 1994.
2. Jacob Millman, Integrated Electronics, Tata Mc Graw Hill publications, New Delhi, 2003.
3. Murugeshan .R, Electricity and Magnetism, S. Chand & Company Ltd., 2015.
4. Gothman W.H., Digital Electronics, Prentice Hall of India PVT., New Delhi, 1996.
5. Rajendran .V, Applied Physics, TATA Mc Graw hill publications, New Delhi, 2002.

Total Number of Topics Present in the course:65

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	04
2.	Regional	04
3.	National	04
4.	Global	65

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

APPLIED PHYSICS -II (PRACTICAL)

1. SemiConductor diode - Characteristics.
2. Zener diode - Characteristics.
3. FET- Characteristics.
4. Transistor Characteristics - CE configuration.
5. Transistor Characteristics - CB Configuration.
6. Metre Bridge-Specific Resistance.
7. Potentiometer-Measurement of Current.
8. Potentiometer-Calibration of low range voltmeter.
9. LCR - Series resonance circuit.
10. LCR - Parallel resonance circuit
11. Mathematical Operator-Addition, Subtraction using OP-Amp.
12. Logic Gates (AND, OR, NOT) Using discrete components.
13. NAND and NOR as Universal Gates.
14. Half Adder and Half Subtractor using logic gates.
15. Full Adder and Full Subtractor using logic gates.
16. Verification of De-Morgan's Theorems.
17. Seven Segment Display using IC-7447
18. Convert binary to decimal using Decoder network.
19. Convert decimal to binary using Decoder network.
20. Study the op-amp as Adder and Sub tractor circuit.

References

1. Srinivasan M.N., Balasubramanian S. & Renganathan R., A Text book of Practical Physics, Sulthan Chand & Sons, New Delhi, 2000.
2. Somasundram S., Practical Physics, Apsara Publications, Tiruchirappalli, 2012.

Total Number of Topics Present in the course:20

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	20

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

APPLIED PHYSICS-III

Semester: IV **18UPH4AC5**

Objectives:

- To know about the difference between conductors, insulators and semiconductors
- To have a basic idea about the lasers and optoelectronic devices
- To learn about the operational amplifier and transistor

Unit I: Semiconductor Physics

Theory of energy bands in crystals - Distinction between conductors, Insulators and Semiconductors - Intrinsic and Extrinsic semiconductors - Hall effect in semiconductor- Zener diode -Tunnel diode - Backward diode - Breakdown voltage - Avalanche Breakdown.

Unit II: Transistors

Transistors – types - PNP and NPN transistors - DC Characteristics of CE and CB configuration - Hybrid parameters - Functions of Transistor as an amplifier and oscillator - FET - N-channel FET - Performance characteristics - FET amplifier - Advantages.

Unit III: Lasers

Introduction - Laser and Maser - Basic concepts of stimulated emission - Spontaneous emission - Conditions for Laser action - Population inversion and Meta stable state - Pumping methods - He-Ne laser - Ruby laser - Ammonia Maser - Production – Advantages - Co_2 -Laser - Disadvantages - - applications.

.**Unit IV: Opto-Electronic Devices**

LED Radiation transition - Emission spectra - Luminescent efficiency - Method of Excitation-Visible LED - Materials for LED - LED configuration and performance - Photo conduction - Photo diode, Photo transistor - Electronic watches - Seven segment display – LCD - -applications.

Unit V: Operational Amplifier

Introduction - The basic operational amplifier - Inverting and non- inverting operational Amplifier - Summing Amplifier - Differential operational amplifier - Integrating Amplifier - CMRR - Basic uses of operational amplifier as sign and scale changer and phase shifter - Adder - Subtractor - Comparator - Differentiator .

Book for study:

1. Theraja B.L., The fundamentals of solid state physics, Sultan Chand& Co., Delhi, 2002 (Unit I).
2. Ramaswami.V, Engineering Physics, D.Prentice Hall of India, New Delhi, 1953 (Unit III).
3. V.K. Metha, Rohit Metha, Basic Electronics, S. Chand & Co., New Delhi, 2015 (Unit II, IV & V).

References

1. Jacob Millman, Micorelectronics, McGraw Hill publications, New Delhi, 1985.
2. Mithal G.K. and Vanvasi, Pulse and Digital electronics, Khanna publication, New Delhi, 2006.
3. Ramanan, Function Electronics, TMH, New Delhi, 1994.
4. Millman & Halkias, Electronics Devices and Circuits, McGraw-Hill, 1967.

Total Number of Topics Present in the course:60

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	60

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

(Specimen copy for Science)

Thanthai Hans Roever College (Autonomous)
Elambalur, Perambalur-621 220

M.Sc.PHYSICS

CHOICE BASED CREDIT SYSTEM -
LEARNINGOUTCOMESBASEDCURRICULUMFRAMEWORK(CBCS-LOCF)

(Applicabletothecandidatesadmittedfromtheacademicyear2022-2023onwards)

Sem.	Name of the Courses	Course Code	Title of the Course	Ins. Hrs	Credit	Exam Hrs	Marks		Total
							CIA	ESE	
I	CC-I	22PPH1CC1	Mathematical Physics – I	6	5	3	25	75	100
	CC-II	22PPH1CC2	Classical Mechanics and Relativity	6	5	3	25	75	100
	CCC-I (Anyonechoice)	22PPH1CCC1:1 22PPH1CCC1:2	1.Electronics (Or) 2. Optoelectronics	6	5	3	25	75	100
	CP-I	22PPH1CP1	Physics Practical - I (General Physics and Electronics I)	6	3	6	40	60	100
	EC-I (Anyonechoice)	22PPH1EC1:1 22PPH1EC1:2	1. Numerical methods and Programming (Or) 2. Computational Physics	6	4	3	25	75	100
	VAC-I (Any one Choice)	22PVAPH1:1 22PVAPH1:2	1. Research Publication And Ethics (Or) 2.Envirnomental Physics	-	2*	3	25	75	100*
	Total			**30**	**22**	**-**	**-**	**-**	**500**
	CC-III	22PPH2CC3	Mathematical Physics – II	6	5	3	25	75	100
	CC-IV	22PPH2CC4	Quantum Mechanics	5	5	3	25	75	100
	CCC-II	22PPH2CCC2:1	1. Thermodynamics and	5	5	3	25	75	100

II	(Anyonechoice)	22PPH2CCC2:2	Statistical Mechanics (Or) 2. Solar Cell						
	CP-II	22PPH2CP2	Physics Practical – II (Microprocessor and C Programming)	6	3	6	40	60	100
	EC-II (Anyonechoice)	22PPH2EC2:1 22PPH2EC2:2	1. Microprocessor and Microcontroller (Or) 2. Electronics Instrumentation	5	4	3	25	75	100
	NME-I	22PPH2NME1:1 22PPH2NME1:2	1. Physics for Everyone (Or) 2. Geophysics	3	2	3	25	75	100
	Extra Credit Course**	22PPH2OC	SWAYAM/NPTEL Online Course		2**				
	Total			**30**	**24**	**-**	**-**	**-**	**600**
III	CC-V	22PPH3CC5	Electromagnetic Theory	6	5	3	25	75	100
	CC-VI	22PPH3CC6	Condensed Matter Physics	6	5	3	25	75	100
	CCC-III (Anyonechoice)	22PPH3CCC3:1 22PPH3CCC3:2	1. Spectroscopy (Or) 2. Astrophysics	6	5	3	25	75	100
	CP-III	22PPH3CP3	Physics Practical – III (GENERAL & ELECTRONICS II)	6	3	6	40	60	100
	EC-III (Anyonechoice)	22PPH3EC3:1 22PPH3EC3:2	1. Nuclear & Particle Physics (Or) 2. Plasma Physics	6	4	3	25	75	100
	VA-II (Anyonechoice)	22PVAPH2:1 22PVAPH2:2	1. Mobile Phone Servicing (Or) 2.Physics of Sports	-	2*	3	25	75	100*
	Total			**30**	**22**	**-**	**-**	**-**	**500**
	CC-7	22PPH4CC7	Crystal Growth and Thin film Physics	6	5	3	25	75	100
	CC-8	22PPH4CC8	Nano Science and Nano	6	5	3	25	75	100

			Technology						
IV	E/IBC	22PPH4E/ 22PPH4IBC	Electric Energy Generation,Utilization and Conservation	6	5	3	25	75	100
	NME-II	22PPH4NME2:1 22PPH4NME2:2	1. Nanophysics (Or) 2. Advanced Medical Physics	3	2	3	25	75	100
	Project	22PPH4PW		9	5	3	Evaluation-80 Viva-Voce-20		100
	Total			**30**	**22**	**-**	**-**	**-**	**600**
Grand total				**120**	**90**	**-**	**-**	**-**	**2100**

*
Thevalueaddedcoursescreditwillnotbeincludedinthetotal CGPA.Thesecoursesa reextra-creditcourses.

Instructionhoursforthesecoursesis30hours.

** Not considered for grand total & CGPA

SUMMARYOFCURRICULUMSTRUCTUREOFPGPROGRAMMES

Sl. No.	TypesoftheCourses	No.of Courses	No.of Credits	Marks
1.	CoreCourses	8	40	800
2.	CoreChoiceCourses	3	15	300
3.	CorePracticals	3	9	300
4.	ElectiveCourses	3	12	300
5.	Entrepreneurship/IndustryBasedCourse	1	5	100
6.	Project	1	5	100
7.	Non-MajorElective Courses	2	4	200
	Total	21	90	2100
	ValueAddedCourses*	2*	4*	200*

*
Thevalueaddedcoursescreditwillnotbeincludedinthetotal CGPA.Thesecoursesa reextra-creditcourses.

Instructionhoursforthesecoursesis30hours.

1. Theory Internal 25 marks External 75 marks
2. Practical Internal 40 marks Internal 60 marks
3. Separate passing minimum is prescribed for Internal and External

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)

b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)

c) The passing minimum not less than 50% in the aggregate.

MATHEMATICAL PHYSICS – I

Core Course: I
Course Code: 22PPH1CC1
Hours / Week: 6
Credit: 5

Semester: I
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Usefulness of vector integration theorems and relation between surface, line and volume integration are shown. Application of these theorems in electromagnetic theory and other physical problems are illustrated.
- Understand the usefulness of matrices and matrix operations in different physical contexts
- Discuss the tensor analysis
- Complex analysis, residues and singularities
- Group theory classes and symmetry

UNIT-I: VECTOR ANALYSIS AND VECTOR SPACES

Laplacian - Gauss's divergence theorem, Green's theorem and Stoke's theorem (statement and proof) - Orthogonal curvilinear coordinates - Expression for gradient, divergence, curl and Laplacian in cylindrical and spherical co-ordinates (Theory)- Eigen values - Eigen vectors. Linearly dependent and independent sets of vectors - Inner product (problems)- Schmidt's orthogonalization process. Line integral- surface integral - volume integral.

UNIT-II: MATRICES

Types of Matrices and their properties, Rank of a Matrix, Eigenvalue Equations and their solutions, Theorems on Matrices; Diagonalisation and Diagonalisation of different matrices; Characteristic equation of a matrix - Cayley-Hamilton's theorem – Sylvester's theorem.

UNIT–III: TENSOR ANALYSIS

Definition of Tensors – Contravariant, covariant and mixed tensors – Rank of a tensor - addition and subtraction of Tensors – Summation convention- Symmetric and Anti-symmetric Tensor – Contraction and direct product – Quotient rule- Pseudo tensors, Levi-Civita Symbol - Dual tensors, irreducible tensors-Metric tensors-Christoffel symbols – Equations of a Geodesic.

UNIT-IV: COMPLEX VARIABLE

Functions of complex variables – Differentiability – Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities – Cauchy's residue theorem – Evaluation of definite integrals.

UNIT-V: GROUP THEORY

Definition - Subgroups - Cyclic groups and abelian groups - Homomorphism and isomorphism of groups - Classes - Symmetry operations and symmetry elements - Representations of groups - Reducible and irreducible representations - Character tables for simple molecular types (C2v and C3v point group molecules).

BOOKS FOR REFERENCE:

1. Mathematical Physics, B.D. Gupta, Vikas Publishing House Pvt. Ltd, 1995.
2. Mathematical Physics, B.S.Rajput, 20th Edition, PragatiPrakashan, 2008.
3. Mathematical Physics, H.K. Dass and Rama Verma, S.Chand and Company Ltd, 2010.
4. Mathematical Physics, P.K. Chattopadhyay, Wiley Eastern Limited, 1990.
5. Introduction to Mathematical physics, Charlie Harper, Prentice Hall of India Pvt.Ltd, 1993.
6. Applied Mathematics for Engineers and Physicists, L.A. Pipes and L.R. Havevill, McGraw HillPublications Co., 3rd Edition, 1971.
7. Theory and Problems of Laplace Transforms, Murray R. Spigel, Schaum's outline series, McGrawHill, 1986.
8. Matrices and Tensors in Physics, A.W. Joshi, Wiley Eastern limited, 3rd Edition, 1995.
9. Mathematical Physics, Satya Prakash, Sultan Chand & Sons, New Delhi, 4th Edition, 2004.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PPH1CC1		MATHEMATICAL PHYSICS – I			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:69

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	69

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

CLASSICAL MECHANICS AND RELATIVITY

Core Course: II | Semester: I
Course Code: 22PPH1CC2 | MaximumMarks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 External Marks : 75

COURSE OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

• Derivation of Euler Lagrange equations for a system of particles (D'Alembert'spriciple andVariational Principle)
• Description of Hamiltons equations of motion
• Discussion on the centre force problem: Kepler's problem, classical scattering
• Obtain the resonant frequencies and the normal modes of a linear triatomic molecule and discussthenature of oscillations
• Derivation of the relativistic addition of velocity formula for parallel velocities in the special theory of relativity and Lagrangian and Hamiltonian of realistic particles.

UNIT I: LAGRANGIAN FORMALISM

Constraints and Degrees of Freedom - Generalized Coordinates: Generalized displacement, acceleration, momentum, force & potential – Virtual work- D'Alemberts principle-Lagrange's equation of motion - Application of Lagrange's equation of motion: Linear Harmonic Oscillator, Simple pendulum, Atwood machine.Lagrangian formulation: System of particles

UNIT II: HAMILTONIAN FORMALISM

Phase space – Hamiltonian– Hamilton's canonical equation of motion– Properties-Significance of H - Deduction of canonical equation from variation principle - Application of Hamilton's equation of motion: Bead on a rotating wire, particle in a core - Principle of least action - Canonical transformations - Generating function and different forms-Poisson brackets and its properties.

UNIT III: HAMILTON – JACOBI METHOD

Hamilton Jacobi method - Solution of harmonic oscillator by Hamilton Jacobi method – Application of Hamilton Jacobi method: Particle falling freely - Kepler problem - Poisson's brackets: Definition, Equation of motion in Poisson's bracket.

UNIT IV: RIGID BODY AND THEORY OF SMALL OSCILLATIONS

Rigid bodies – Moments and products of inertia – Euler's angles – Euler's equation of motion of a rigid body – Motion of a symmetric top in a gravitational field – Theory of small oscillations – Normal coordinates and normal modes – Linear triatomic molecules-Force vibrations and dissipation.

UNIT V: RELATIVITY

Reviews of basic ideas of special relativity – Energy momentum four vector – Minkowski'sfour dimensional space – Lorentz transformation as rotation in Minkowski's space –Compositions of Lorentz transformation about two orthogonal directions – Thomas

precession – Invariance of Maxwell's equations under Lorentz transformation – Elements of general theory of relativity.

BOOKS FOR STUDY

1. S.L. Gupta, V. Kumar & H.V. Sharma, Classical Mechanics, PragatiPrakashan, Meerut, 2010.
2. H. Goldstein, Classical Mechanics, Addison Wesley, London, 2002.

BOOKS FOR REFERENCES

1. John Robert Toyler, Classical Mechanics, University Science books, Sausation, Californiya, 2005.
2. David Morin, Introduction to classical mechanics with problems and solutions, Cambridge University press, 2008.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
I	22PPH1CC2		CLASSICAL MECHANICS AND RELATIVITY			6		5		
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓		✓		
CO2	✓	✓	✓	✓	✓	✓		✓	✓	
CO3	✓		✓		✓	✓		✓		✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	
CO5	✓		✓	✓	✓	✓		✓	✓	
Number of Matches(✓) = 34, Relationship: Moderate										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:48

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	48

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

ELECTRONICS

Core Course: CCC-1
Course Code: 22PPH1CCC1:1
Hours / Week: 6
Credit: 5

Semester: I
MaximumMarks: 100
Internal Marks: 25
External Marks: 75

COURSE OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Study the Characteristics of MOSFET
- Understanding of basic concept of Semiconductor, Photo Diode and LED, Solar cell.
- Study and characteristic of dc and ac analysis of Operational Amplifier
- Study the signal processing and its applications
- Understanding the IC fabrication and IC timer

UNIT I: SEMICONDUCTOR DEVICES

Introduction to FET- Types-FET as a voltage variable resistor - Common source amplifier at high frequencies - Common drain amplifier at high frequencies - Silicon Controlled Rectifier (SCR) Characteristics - SCR power control - Tunnel diode-Cathode ray oscilloscope –various controls- Applications- impatt diode -Optoelectronics: Photo resistor, Photo diode, Photo transistor, Photo multiplayer -Photo conductor, LED, Photo voltaic effect, Solar cells.

UNIT II: SPECIAL SEMICONDUCTORS

Thevenin's and Norton's theorems – JFET- Structure and working –Importance- I-V characteristics under different conditions – Biasing circuits – CS amplifier design – AC analysis-salient features – advantages- MOSFET: Depletion and enhancement type MOSFFT – UJT characteristics – Relaxation oscillator — Application in power control DIAC, TRIAC.

UNIT III: OPERATIONAL AMPLIFIER

Introduction to Operational amplifier- characteristics -frequency response–CMRR- square wave generator - Inverting and non-inverting amplifier – Instrumentation amplifier – Voltage follower – Integrating and differential circuits – Log & antilog amplifiers – Op- amp as comparator-Applications–Voltage to current and current to voltage conversions - Active filters: Low pass, high pass, band pass & band rejection filters - Solving simultaneous and differential equations.

UNIT IV: SIGNAL PROCESSING & DATA ACQUISITION

Wave form generators and wave shaping circuits - Sinusoidal oscillators - Phase shift oscillator - Wein Bridge Oscillator - Crystal oscillator – Multivibrators - Comparators - Schmitt trigger Square wave & triangular wave generators - Pulse generators - IC 555 timer and its application - Signal and signal processing - Analog multiplexer and demultiplexer - D/A converters - A/D converters.

UNIT V: IC FABRICATION AND IC TIMER

Basic monolithic ICs – Epitaxial growth – Masking – Etching impurity diffusion - Fabricating monolithic resistors, diodes, transistors, inductors and capacitors – Circuit layout – Contacts and inter connections – Charge Coupled Device (CCD) – Applicationsof CCDs - 555 timer – Description of the functional diagram – Mono stable operation – Applicationsof mono shots – Astable operation - Pulse generation.

BOOKS FOR STUDY

1. Albert Malvino, David J Bates, Electronics Principles, 7th Edition, Tata McGraw Hill PublishingCompany Ltd., New Delhi, 2007.
2. V. K. Mehta, Principles of Electronics, S. Chand & Co, New Delhi, 2015.

BOOKS FOR REFERENCES

1. Jacob Millman& Arvin Grabel, Microelectronics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 22nd Reprint, 2009.
2. Thomas L. Floyd, Electronic Devices, Pearson Education, New York, 2004.
3. J. Milman and C.C. Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi, 1991.
4. A. Mottershed, Semiconductor Devices and Applications, New Age Int. Publications, New Delhi.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PPH1CCC1:1		ELECTRONICS			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =48 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:79

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	04
2.	Regional	04
3.	National	04
4.	Global	79

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

OPTO ELECTRONICS

Core Course: CCC-1 Semesters: I
Course Code: 22PPH1CCC1:2 Maximum Marks : 100
Hours / Week: 6 Internal Marks : 25
Credit: 5 External Marks : 75

COURSE OUTCOMES

- Extensive study of devices helps the students to understand the fundamental scientific concepts necessary to construct various electronic circuits as per their own desire.
- The schematic structure of syllabus is intended to provide optoelectronics knowledge and to encourage the students to design novel fiber optic sensors.
- To study the science of light detectors of various types.
- To understand the design of fiber optic sensor based on the fundamentals of fiber optics. Expected
- Able to understand the measurement of fiber optics.

UNIT-I BASIC OPTICS

Natural, artificial and specialized light sources, Characterization of light sources based on intensity spectrum, emission, spatial distribution, conversion efficiency. Experimental methods for studying these characteristics- uses of optical filters, their disadvantages and necessity and use of monochromatic source, wave nature of light, Reflection and refraction, Snell's law, Total internal reflection.

UNIT - II LIGHT SOURCES

LED: Characteristics – Efficiency - hetero junction, double hetero structure light sources, quantum efficiency - internal and external quantum efficiency, expression for total and internal quantum efficiency. LASER: Properties, characteristics - Study of three level LASER - Ruby LASER - Study of four level Laser – He-Ne Laser, CO2 Laser, Nd-YAG laser, semiconductor laser and Applications..

UNIT - III LIGHT DETECTORS

Idea of light detectors and their basic types, natural and specialized light detectors, Type of specialized light detectors: thermal, quantum light detectors, Types of quantum photo detectors: photo resistive, photovoltaic, photo emissive detectors- Study of quantum detectors: photoelectric cell, photomultiplier tube, photodiode.

UNIT - IV OPTICAL FIBER -THEORY AND APPLICATIONS

Optical fiber – principle - Types of optical fiber - Fabrication of optical fiber -Step index and graded index fibers, Types of Modes - angle of acceptance - numerical aperture. Attenuation in Optical fiber – Losses: intrinsic losses - atomic scattering and molecular absorption-extrinsic losses - micro bends, cracks – losses due to connectors, angular misalignment, mismatch of rate indices of fiber material. Optical fiber communication and Advantages.

UNIT - V MEASUREMENT ON OPTICAL FIBER

Fiber attenuation measurement, dispersion measurement, numerical aperture measurement, thin wire outer diameter measurement by shadow method, intrinsic fiber sensors measurement - micro bending, Self-referenced fiber optic displacement sensor.

BOOKS FOR STUDY

1. Optical Electronics : AjoyGhatak , Thiyagarajan K
2. An Introduction to Fiber Optics: AjoyGhatak, A K Ghatak , K Thyagarajan
3. Semiconductor Optoelectronic Devices: Pallab Bhattacharya
4. Optoelectronics and Fiber optics Communication: C.K. Sarkar and D.C. Sarkar

BOOKS FOR REFERENCE

1. Fiber Optic Essentials: AjoyGhatak, Thyagarajan K
2. Fiber optic sensors, B.D. Gupta .
3. Fiber optics and Optoelectronics, R.P. Khare, Oxford Press.

Weblink

1.https://www.slideshare.net/JyotiSingh28/types-of-laser-75045103
2.https://www.stl.tech/blog/optical-fibre-cable-working-applications-real-life-usage/
3.https://www.youtube.com/watch?v=8cs4M2kXX_c

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
I	22PPH1CCC1:2		OPTOELETRONICS			6		5		
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓		✓		
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓	✓		✓	✓		✓	✓	
CO4	✓		✓	✓	✓	✓		✓		✓
CO5	✓	✓	✓		✓	✓		✓	✓	
Number of Matches(✓) =35 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:56

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	56

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global

PHYSICS PRACTICAL - I
GENERAL PHYSICS AND ELECTRONICS I

Core Practical - I
Course Code: 22PPH1CP1
Hours / Week: 6
Credit: 3

Semester: I
Maximum Marks : 100
Internal Marks : 40
External Marks : 60

Any **TWELVE** Experiments (choosing a minimum of six experiments from each part)

COURSE OUTCOMES

- Understand various technique and concepts in electronics experiments
- Develop the skill in handling instruments
- Gaining Knowledge about the concepts in electronics
- Study the characteristics of FET, UJT and SCR.
- Design and study the Multivibrator

A. General Physics Experiments:

1. Determination of q, n, b by elliptical fringes method
2. Determination of q, n, b by hyperbolic fringes method
3. Determination of bulk modulus of a liquid by ultrasonic wave propagation
4. Determination of Stefan's constant
5. Identification of prominent lines by spectrum photography – Copper spectrum
6. Identification of prominent lines by spectrum photography – Iron spectrum
7. Calculate the energy loss of a magnetic material using BH loop– Anchor ring using B.G.
8. Determination of dielectric constant at high frequency by Lecher wire
9. Determination of e/m of an electron by magnetron method
10. Determination of e/m of an electron by Thomson's method
11. Determination of L of a coil by Anderson's method
12. Determination of Planck's constant value 'h' using Photoelectric effect .

B. Electronics Experiments:

13. Study of a feedback amplifier – Determination of band width, input and output impedances.
14. Design and study of monostablemultivibrator
15. Design and study of bistablemultivibrator
16. Design and study of phase shift Oscillator (Op-amp)
17. Study the characteristics of FET
18. Study the characteristics of UJT
19. Study the characteristics of SCR
20. Test the performance of the Common source amplifier using FET
21. Test the performance of the Common drain amplifier using FET
22. Construct the relaxation oscillator using UJT or OP-Amp and measure the frequency of the oscillation.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PPH1CP1		PHYSICS PRACTICAL - I			8			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓		✓	✓
CO2	✓	✓		✓	✓	✓	✓		✓	✓
CO3	✓	✓		✓	✓	✓	✓		✓	✓
CO4	✓	✓		✓	✓	✓	✓		✓	✓
CO5	✓	✓		✓	✓	✓	✓		✓	✓
Number of Matches(✓) = 45, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:22

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	22

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

NUMERICAL METHODS AND PROGRAMMING

Elective Course: I
Course Code: 22PPH1EC1:1
Hours / Week: 6
Credit: 4

Semester: I
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After successfully completing the course, the student will

- Understand the concept of errors and the measurements
- Describe the concept of Numerical Integration
- Explain Numerical Solution of ordinary Differential Equation
- Understand the concept of Interpolation formulas
- Find out the solution of Linear and Non-Linear equations

UNIT-I: ERRORS AND THE MEASUREMENTS

General formula for errors – Errors of observation and measurement - Absolute and relative errors, Machine Epsilon - Error propagation - Conditioning and stability - Error estimation- Empirical formula -Graphical method – Method of averages – Least square fitting – curve fitting - parabola, exponential.

UNIT II: NUMERICAL INTEGRATION

Newton cotes formula - Trapezoidal rule - Errors in Trapezoidal rule -Simpsons rule - Simpsons 1/3 rule - errors in the formula-Simpsons 3/8 rule- Extended simpson's rule - Booles rule - Gaussian quadrature method - (2 point and 3 point formulae) – Giraffe's root square method for solving algebraic equation.

UNIT III: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Nth order ordinary differential equations – Power series approximation – Pointwise method – Solutions of Taylor series – Euler's method – Improved Euler's method – Logical global fraction error- Runge-Kutta method: first, second and fourth order – Runge-Kutta method for solving first order differential equations – Draw the Flow chart, algorithm and C program for solving ordinary differential equations using RK method

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UNIT IV: INTERPOLATION

Linear interpolation – Lagrange interpolation - Gregory–Newton forward and backward interpolation formula – Central difference interpolation formula – Gauss forward and backward interpolation formula – Divided differences: Properties – Newton's interpolation formula for unequal intervals – C programming for Lagrange's interpolation.

UNIT V: SOLUTION OF LINEAR & NONLINEAR EQUATIONS

Need and scope of simultaneous linear equations - Existence of solutions - Solution by elimination - Gauss elimination method with and without pivoting - Applications to electrical networks - C program for implementing Gauss elimination method with pivoting. Roots of nonlinear equations: Newton-Raphson's method for a single nonlinear equation - Extension to a system of nonlinear equations - Finding multiple roots by deflation and synthetic division - Program in C for Newton-Raphson method for finding the roots of a single nonlinear equation.

BOOKS FOR STUDY

1. T.Veerarajan, T.Ramachandran, Numerical Methods with Programs in C, Tata McGraw Hill Publishing Company, New Delhi,2008.
2. E. Balagurusamy, Numerical Methods, Tata McGraw Hill Publishing Company, New Delhi, 1999.

BOOK FOR REFERENCES

1. M.K. Venkataraman, Numerical Methods in Science and Engineering, National Publishing Co., Madras,1996.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall, 2005.
3. S. Rajasekaran, Numerical Methods in Science and Engineering, S. Chand Limited, 2003.

Web link:

1.https://www.youtube.com/watch?v=pOtnzAXlXvI&list=PLwdnzlV3ogoUY43XoMwVVCWDSImC9mVQB.

2.https://www.youtube.com/watch?v=pOtnzAXlXvI&list=PLwdnzlV3ogoUY43XoMwVVCWDSImC9mVQB

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PPH1EC1:1		NUMERICAL METHODS AND PROGRAMMING			6			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 45, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:54

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	54

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

COMPUTATIONAL PHYSICS

Elective Course: I
Course Code: 22PPH1EC1:2
Hours / Week: 6
Credit: 4

Semester: I
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After successfully completing the course, the student will

- Understand the basic concepts of C++.
- Study the Functions and Classes.
- Study the I/O operation and file streams operation.
- Understand the concept of Approximation of a function and Numerical calculus.
- Explain the Numerical Solution of ordinary Differential Equation.

UNIT-I:

Beginning with C++ Basic concepts of OOP - Benefits and Applications of OOP - Introduction to C++ - What is C++-Applications of C++ - A Simple C++ Programme –More C++ Statements – An Example with Class–Structure of C++Program – Creating the Source File –compiling and Linking. Tokens, Expressions and Control Structure: Introduction – Tokens – Keywords – Identifiers – Basic Data Types – User-Defined Data Types – Derived Data Types – Symbolic Constants – Type Compatibility–Declarations of Variables – Dynamic Initialization of Variables – Reference Variables–Operators in C++ - Scope Resolution Operator – Memory Management Operators –Manipulators – Type Cast Operator – Expressions and Implicit Conversions –Operator Overloading – Operator Precedence – Control Structures – if Selection Statement – if else statement – do while repetition Statement –Nested Control Statements.

UNIT-II:

Functions, Classes and Objects in C++: Introduction – The Main Function-Function Prototyping – Call by Reference – Return by Reference – Inline Functions –Default Arguments – Const. Arguments– Function Over loading – Friend and Virtual Functions. Classes and Objects: Introduction – C Structures Revisited –Specifying a Class - Defining Member Functions – A C++ Program with Class –Making an Outside Function Inline - Nesting of Member Functions – Private Member Functions –Arrays Within a class – Memory Allocation for Objects – Static Data Members –Static Member Functions – Arrays of Objects –Objects as Function Arguments – Friendly Functions.

UNIT-III:

Managing console I/O operations Introduction - C++ Streams - C++ Stream Classes – Unformatted I/O Operations – Formatted Console I/O Operations –Managing Output with manipulators. Working with files. Introduction – Classes for Files Stream Operations - Opening and Closing a Files – opening of a file using constructor –two file streams working on separate files and two file streams working on a single file-streams working on multiple files-Detecting end – of – file – More about Open ( )-File Modes – File Pointers and their Manipulations –Sequential Input and ( ) Output Operations – Updating a File: Random Access – Error Handling During File Operations - Command.

UNIT-IV:
Approximation of a function: Interpolation - Least- squares Approximation - Random - number generators - Introduction to Lagrange polynomials –Numerical Calculus: Numerical Differentiation – Numerical Integration –Trapezoidal rule – Simpson's rules – Newton – Cotes formulas – Gaussian quadrature formula – Estimation of errorsin evaluating the integrals Roots of Equation – Extremes of a function – Bond length of a molecule.

UNIT-V:
Ordinary differential equation: Initial – value problems - Taylor's series method –The Euler and Picard methods – Predictor – corrector methods – The Runge–Kutta method – Chaotic dynamics of a driven pendulum – Boundary–value and Eigen value problems – The Shooting Method – Linear equations and the Sturm-Liouville problem - The1-D Schrödinger equation.

BOOKSFORSTUDY:

1. Units I and II: Object Oriented Programming with C++ - E. Balagurusamy, TMH, 1999(Chap:2,3,4&5).
2. Unit III, IV & V: An Introduction to Computational Physics (2nd edn.)– TAOPANG, Cambridge, 2006(Chap.2,3 (selected sections) 4,7).

BOOKSFORREFERENCE:

1. Programming in C++- R. RAVICHANDRAN (2001).
2. Object Oriented Programming and C++ - R.RAJARAM, New Age International (1999).

Web Link:

1.https://www.simplilearn.com/tutorials/cpp-tutorial/cpp-basics.
2.https://www.youtube.com/watch?v=D3WiD7qjZbc.
3.https://www.youtube.com/watch?v=ejqSmlV4lSc.
4.https://www.youtube.com/watch?v=Ym1EUjTWMnE

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
I	22PPH1EC1:2	COMPUTATIONAL PHYSICS	6	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:107

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	107

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global

RESEARCH PUBLICATION AND ETHICS

Value added Course: I
Course Code: 22PVAPH1:1
Hours / Week:
Credit: 2

Semester: I
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

- Understand the concept of ethics and philosophy
- Gaining the knowledge of publication through the scientific way
- Study how to recover the problems in the publications
- Understand the enhancement of publications with plagiarism tools
- Acquire the knowledge on importance of researchmetrics

UNIT–I PHILOSOPHY ANDETHICS:

Introduction to philosophy: definition - Nature and scope - Concept - Branches – Ethics: Definition - Moral philosophy - Nature of moral judgements and reactions.

UNIT–II SCIENTIFICCONDUCT:

Ethics with respect to science and research – Intellectual honesty and research integrity – Scientific misconducts: Falsification, Fabrication and Plagiarism(FFP) - RedundantPublications:duplicateandoverlappingpublications,salamislicing -Selective reporting and misrepresentation ofdata.

UNIT–III PUBLICATIONETHICS:

Publication ethics: definition, introduction and importance – Conflicts of interest - Publication misconduct: definition, concept, problems that lead to unethical behavior and vice – versa, types – Violation of publication ethics, authorship and contributorship– Identification of publication misconduct, complaints and appeals – Predatory publisher andjournals.

UNIT–IV OPEN ACCESS PUBLISHING AND PLAGIARISMTOOLS:

Open access publications and initiatives – SHERPA/RoMEO online resource tocheck publisher copyright & self – archiving policies – Software tool to identify predatory publications developed by SPPU – Journal finger / journal suggestion tollsviz.JANE,ElsevierJournalFinder,Springer,JournalSuggester,etc.Use of plagiarism software like Turnitin, Urkund and other open source software tools.

UNIT–V DATABASES AND RESEARCHMETRICS:

Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc. Research Metrics: Impact Factor of journal as per journal Citations Report, SNIP,SJR,IPP,Citationscore–Metrics:h-index,gindex,i10Index,altmetrics.

REFERENCES:

1. K. Ravichandran, A. T. Ravichandran, M. Ayyanar and P. Kavitha, ResearchMethodology and Publication Ethics (Jazym Publications, Tiruchirappalli, 2022).
2. N. H. Steneck, Introduction to the Responsible Conduct of Research (Office of Research Integrity, Maryland,2007).
3. P. Oliver, Student's Guide to Research Ethics (Open University Press, United

Kingdom,2003).
4. A. E. Shamoo and D. B. Resnik, Responsible Conduct of Research (Oxford University Press, Oxford,2003).
5. A. B.H. Dursaton and M. Poole, Thesis and Assignment Writing (Wiley Eastern, New York,1997).
6. B. Gustavii, How to Write and Illustrate Scientific Papers? (Cambridge University Press, Cambridge,2008).
7. K. S. Bordens and B. B. Abbott, Research Design and Methods (McGraw Hill, New York,2008).
8. A. M. Graziano and M. L. Raulin, Research Methods – A Process ofInquiry (Pearson, New York, 2020).
9. https://ori.hhs.gov/sites/default/files/rcrintro.pdf
10. https://www.enago.co.kr/academy/wp-content/uploads/2018/05/Research_Ethics.pub_V2.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
I	22PVAPH1:1		RESEARCH PUBLICATION AND ETHICS						2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 44, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:26

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	26

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

ENVIRONMENTAL PHYSICS

Value Added Course: I
Course Code: 22PVAPH1:2
Hours / Week: -
Credit: 2

Semester: I
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To identify the physical mechanisms involved in environmental issues.
- To assess the complexity of environmental physics problems.
- To design the solutions for environmental degradation problems.

COURSE OUTCOMES:

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

- Demonstrate understanding of the inherent forces
- Know the flows responsible for various naturally occurring events.
- Understand the Heat transfer through different medium.
- Apply the theory to quantify the fluxes across the interfaces.
- Solve simple transport problems in natural environment

UNIT I: Properties of Gases and Liquids

Physical properties of gases – density - heat capacity - molecular diffusivity - exchanges between organisms or land surfaces - their environment - Evaporation of water from soils – plants – animals - surface water bodies - Cloud Physics.

UNIT II: Transport of Heat, Mass and Momentum

Transport of heat – mass - momentum in the atmosphere - soil – vegetation - water. Mass transfer by Gases - water vapour - particles. Mass diffusion - Mass exchange between air plants and animals - Properties of turbulence - Roughness parameters - Aerodynamic resistance - Bowen ratio - flux gradients- wind speed gradients - Turbulent transfer - profiles and fluxes across vegetation canopies.

UNIT III: Conduction, Convection, Advection

General equation for transport within a gas - Vertical fluxes - Eddy Covariance – Conduction - Convection - Advection in gases, liquids and solids. Diffusion coefficients for momentum - heat - water vapor - and other gases and dependence on temperature - Transient heat balance - Sensible heat flux - latent heat flux.

UNIT IV: Radiation Environment

Properties of Electromagnetic radiation - Principles of radiation absorption and emission - Concepts of BlackBody - Wein's law - Kirchoff's law - Planck's law - Stefan-Boltzman's law - Radiative exchange between layers and surfaces - radiative resistance - Cosine law - Spectral reflectivity - absorptivity - Beer's law - Kubelka-Munk Equations.

UNIT V: Irradiance and radiance

Principle of scattering - absorption - shortwave - long wave radiation - Aerosol Optical depth - Single scattering Albedo - Radiation balance - concept of radiative forcing .

BOOKS FOR STUDY:

1. Monteith J. and Unsworth, M., Principles of Environmental Physics: Plants, Animals, and the Atmosphere, 4e, Academic Press, 2013.
2. Campbell G.S., Norman, J.M., An Introduction to Environmental Biophysics, 2e, SpringerVerlag, New York, 1997.

BOOKS FOR REFERENCE:

1. Petty, G.W., A First Course in Atmospheric Radiation, second ed. Sundog Publishing, 2006.
2. Foken, T. Micrometeorology. Springer-Verlag, Berlin, Heidelberg, 2008.

WEB LINK:

https://environment.princeton.edu/videos/the-physics-of-climate-change-three-blackboard-lectures-on-simple-models-in-climate-science/

www.businesstrainingmedia.com/environmental.php?gclid=CjwKCAjwpqCZBhAbEiwAa7pXeUZjAFggtBCFs0blcq9MrbE92nqjQ89mNMG0aMvtZh9_ePe4Ij1jIxoCVL4QAvD_BwE

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
I	22PVAPH1:2		ENVIRONMENTAL PHYSICS			-		2		
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓		✓	✓	✓	✓	✓	
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 43, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	57

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

MATHEMATICAL PHYSICS – II

Core Course: III
Course Code: 22PPH2CC3
Hours / Week: 6
Credit: 5

Semester: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Probability and its applications in physics problems.
- Special functions for Legender and Bessel Polynomials
- Special functions for Hermite and Laguerre polynomial
- Partial ordinary Differential Equations and its applications
- Properties of Laplace transform and inverse transform, various related and few applications.

UNIT-I: PROBABILITY

Classical definition of Probability - Probability - Addition rule of Probability - Multiplication Law of Probability - Probability distribution - Binomial distribution – The first four moments of Binomial distribution - Poisson distribution - Normal distribution – The first four moments of Poisson and Normal distribution- Applications of Binomial, Poisson and Normal distributions – Central limit theorem.

UNIT-II: SPECIAL FUNCTIONS – I

Strum-Liouville problem-Gamma and Beta function- Legendre's differential equation: Legendre polynomials - Generating functions - Recurrence relation - Rodrigue's formula - Orthogonality; Bessel's differential equation: Bessel polynomials - Generating functions - Recurrence relation -Rodrigue's formula – Orthogonality.

UNIT-III: SPECIAL FUNCTIONS – II

Hermite differential equation – Generating functions – Hermite polynomials - Recurrence relations – Rodrigue's formula - Orthogonality: Laguerre differential equations – Generating functions - Laguerre polynomials - Recurrence relation - Rodrigue's formula – Orthogonality.

UNIT-IV: PARTIAL DIFFERENTIAL EQUATIONS

Properties of Laplace transform – Solution of Laplace Differential Equation –Two-dimensional flow of heatincartesian and cylindrical co-ordinates-Solution of heat flow equationin one dimension-Solution of wave equation -Transvers e vibrations of a stretched string (Theory).

UNIT - V: INTEGRAL TRANSFORMS

Fourier transforms - cosine and sine transforms- Linearity theorem - Parseval's theorem - solution of differential equation. Laplace transforms - Definition - Linearity, shifting and change of scale properties. Inverse Laplace transforms – Definition - Problems - Solution of differential equation (problems using the above methods).

BOOKS FOR REFERENCE:

1. Mathematical Physics, B.D. Gupta, Vikas Publishing, 1995.
2. Mathematical Physics, B.S. Rajput, 20th Edition, PragatiPrakashan, 2008.
3. Mathematical Physics, H.K. Dass and Rama Verma, Chand and Company Ltd, 2010.
4. Mathematical physics, P.K. Chattopadhyay, Wiley Eastern Limited, 1990.
5. Introduction to Mathematical Physics, Charlie Harper, Prentice Hall of India Pvt. Ltd, 1993.
6. Applied Mathematics for Engineers and Physicists, L.A. Pipes and L.R. Havevill, 3rd Edition, McGraw Hill, 1971.
7. Theory and problems of Laplace Transforms, Murray R. Spigel, International edition, McGraw Hill, 1986.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
II	22PPH2CC3		MATHEMATICAL PHYSICS – II				6		5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓				
CO2	✓		✓	✓		✓		✓	✓	
CO3	✓		✓	✓		✓		✓	✓	
CO4	✓	✓	✓	✓	✓	✓			✓	
CO5	✓	✓	✓	✓	✓	✓		✓		
Number of Matches(✓) = 32, Relationship: Moderate										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:53

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	53

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

QUANTUM MECHANICS

Core Course: IV
Course Code: 22PPH2CC4
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

Upon completion of this course students should able to

- Explaining the postulates of quantum mechanics.
- Identification of features of certain exactly solvable systems.
- Describing the time-independent and time-dependent perturbation theories.
- Describe the method of angular momentum and commutation relation.
- Application of the Born approximation and partial wave analysis to simple systems.

Determine the solution of a relativistic free Dirac particle.

UNIT I: SCHRODINGER EQUATION AND GENERAL FORMULATION

Physical meaning and conditions on the wave function- momentum - Schrodinger equation – Expectation values and Ehrenfest's theorem – Hermitian operators and their properties – Eigen function of a Hamiltonian operator – Commutator relations - Uncertainity relation - Bra and ket vectors - Hilbert space – Linear harmonic oscillators – Particle in a box –Tunnel effect, Rigid rotator ,Hydrogen atoms –Schrodinger, Heisenberg and interaction pictures.

UNIT II: APPROXIMATE METHODS

Time independent perturbation theory in non-degenerate case- Ground state of Helium atom - Degenerate case - Stark effect in hydrogen - Variation method & its application to Hydrogen molecule - WKB approximation and its application.

UNIT III: TIME DEPENDENT PERTURBATION THEORY

Time dependent perturbation theory - First and second order transitions - Transition to continum of states - Fermi Golden rule - Constant and Harmonic perturbation - Transition probabilities - Selection rules for dipole radiation- Non degenerate perturbation theory – degenerate perturbation theory –fine structure of hydrogen-the realistic correction – spin orbit coupling- Zeeman effect- weak field and strong field Zeeman effect .

UNIT IV: ANGULAR MOMENTUM

Elementary ideas of spin angular momentum of an electron - Orbital angular momentum - Spin angular momentum - Total angular momentum operators - Commutation relations of total angular momentum with components - Ladder operators - Commutation relation of Jz with J+ and J- - Eigen values of J2, Jz - Matrix representation of J2, Jz, J+ and J- - Addition of angular momenta - Clebsch Gordon coefficients –(J1=1/2,J2=1/2).

UNIT V: SCATTERING THEORY & RELATIVISTIC QUANTUM MECHANICS

Scattering cross section – Green's function – Born approximation – Partial wave analysis – Klein-Gordon equation for a free particle and in an electromagnetic field – Dirac equation for a free particle – Dirac matrices.

BOOKS FOR STUDY

1**.** Gupta, Kumar & Sharma, Quantum Mechanics, 23rd Edition, 2004.
2. P.M. Mathews &K.Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill, New Delhi, 2005.
3. Ghatak**,** Ajoy**,** Lokanathan, S**.**Quantum Mechanics: Theory and Applications, 2004.

REFERENCES

1. I. Schiff, Quantum Mechanics, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2010.
2. Satyaprakash, Quantum Mechanics, PragatiPrakashan.
3. Merzbacher E, Quantum Mechanics, Wiley and Sons, USA, 3rd Edition, 1998.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22PPH2CC4		QUANTUM MECHANICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓		✓	✓	
CO2	✓	✓		✓		✓				
CO3	✓		✓	✓	✓		✓		✓	
CO4	✓	✓			✓	✓		✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 32, Relationship: Moderate										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:53

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	53

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

THERMODYNAMICS AND STATISTICAL MECHANICS

Core Course: CCC-2
Course Code: 22PPH2CCC2:1
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

Upon completion of this course students should able to

- Understand the ways to calculate the thermo dynamical quantities theoretically
- Describe the Liouville theorem and detailed description on different ensembles
- Derive Bose Einstein condensation
- Understand Fermi Dirac condensation
- Illustrate the way to obtain phase transition and their applications in calculating thermo dynamical quantities

UNIT I: THERMODYNAMICS AND RADIATION

Basic postulates of thermodynamics -Laws of thermodynamics – Concept of work, internal energy and heat - Wander walls equation of state - concept of work internal energy heat - thermodynamic system- Entropy and second law of thermodynamics – Principle of increase of entropy - Thermodynamic Potential and Reciprocity relation – Enthalpy, Helmholtz and Gibb's functions – ClausiusClapeyron's equation – Carnot engine - efficiency of Carnot engine – carnot cycle - molar specific heat C_P and C_V.

UNIT II: CLASSICAL STATISTICAL MECHANICS

Phase space and ensembles – Types of ensembles: Microcanonical, canonical & grand canonical - Liouville's theorem – Statistical equilibrium – Thermal equilibrium - Elementary ideas of partition functions -Connection between statistical and thermodynamical quantities - Micro and macro states - Maxwell-Boltzmann distribution law - Distribution of energy and velocity - Principle of equipartition of energy - Boltzmann's entropy relation.

UNIT III: BOSE EINSTEIN STATISTICS

Quantum statistics of identical particles – Density matrix – Bose-Einstein distribution law – Black body radiation – Planck's radiation aw – Specific heat of solids – Einstein's theory – Debye's theory.

UNIT IV: FERMI DIRAC STATISTICS

Fermi-Dirac distribution law – Ideal Fermi-Dirac gas – Fermi energy – Degeneracy: weak degeneracy, strong degeneracy – Electron gas in metals – Thermionic emission of electrons – Specific heat of gases – Variation with temperature: Monoatomic, diatomic and polyatomic gases.

UNIT V: PHASE TRANSITION

Phase transition- Phase transition of first and second kind – Ehrenfest's equation–Wander walls equation and phase transition - Critical exponent – Yang and Lee theory – Landau theory of phase transition- Phase transitions of second kind: The Ising model - Bragg Williams approximation- one dimensional Ising and Heisenberg model

BOOKS FOR STUDY

1. Gupta & Kumar, Statistical Mechanics, PragatiPrakashan, Meerut, 24th edition, 2011.
2. Satya Prakash, J.P. Agarwal, Statistical Mechanics, KedarNath Ram Nath& Co., Meerut, 2005.

REFERENCES

1. B.K. Agarwal and M. Eisner, Statistical Mechanics, New Age International Publishers, 2nd Edition, 1998, Reprint 2005.
2. B.B. Laud, Fundamentals of Statistical Mechanics –New Age International Publishers, New Delhi,2nd Edition 2012.
3. Kerson Huang, Statistical Mechanics, John Wiley & Sons, New Delhi, 2nd Edition, 1983, Reprint 2009. 19
4. F. Reif, Fundamentals of Statistical and Thermal physics, Waveland Press, Illinois, 2009.
5. F. W. Sears, G. L. Salinger, Thermodynamics, Kinetic theory & Statistical Thermodynamics, Narosa Publishing House, New Delhi, 3rd Edition, Reprint 2013.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22PPH2CCC2:1		THERMODYNAMICS AND STATISTICAL MECHANICS			5			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓	✓		✓		✓
CO2	✓	✓			✓	✓		✓	✓	
CO3	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓	✓	✓	✓		✓		✓	✓	
Number of Matches(✓) = 38 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:56

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	56

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

SOLAR CELL

Elective Course: CCC-II
Course Code: 22PPH2CCC2:2
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES:

- The student will be able to know principle of solar cell and types,
- The student will be able to learn Semiconductor materials properties.
- The student will be able to describe the different junction devices.
- The student will be able to demonstrate Fabrication of silicon solar cell.
- The student will be able to understand the fourth generation of solar cells.

UNIT I: INTRODUCTION TO SOLAR CELLS AND SUN LIGHT

Outline of solar cell developments – Physical sources of sunlight – solar intensity at the Earth's Surface – direct and diffused radiation – apparent motion of the sun – solar insolation data – Types of solar energy converter – Photons in, electrons out – Basic principles of Photo-voltaic.

UNIT II: SEMICONDUCTOR MATERIALS, PROPERTIES AND ITS CHARACTERISTICS

Basics of crystal structure and orientations - Basic concepts – electron states in semiconductors – semiconductor in equilibrium – impurities and doping - semiconductor under bias- drint and diffusion – semiconductor transport equations – photo-generation – recombination – formulation of the transport problem

UNIT III: JUNCTION INVESTIGATIONS

Orgin of photovoltaic action – work function and types of junction –Homo-junctions – metal semiconductor junction – semiconductor-semiconductor junctions – electrochemical junction – organic material junctions – surface and interface states – p-n junction – dark and illuminated current — effect of temperature – efficiency loss - short circuit current-open circuit voltage – introduction to various resistance .

UNIT IV: DESIGN, FABRICATION AND CHARACTERIZATION OF SILICON SOLAR CELLS

Basic silicon Solar cells - Basic theoretical performance – Major considerations for solar cell fabrication – doping of the substrate – Back surface fields – top layer limitations – top contact design – optical design – spectral response – cell fabrication process – surface treatment – etching – doping and diffusion – contact formation – solar cell measurement (IV) – analysis of the output- future direction in silicon cell design.

UNIT V: TOWARDS THIRD AND FOURTH GENERATION SOLAR CELLS

Introduction to nanoparticles – concepts of quantum dot solar cells – dye sensitized solar cell – organic solar cells - hybrid solar cell-other types of advanced solar materials and solar cell devices.

BOOKS FOR STUDY:

1. Solar energy utilization -G.D. Rai –Khanna publishers – Delhi 1987.
2. Solar energy – principles of thermal collection & storage – S.P. Sukhatme, TMH Delhi 1984.
3. Maheshwar Sharon, Madhuri Sharon, Carbon "Nano forms andApplications", McGraw-Hill, 2010.

BOOKS FOR REFERENCE:

1. Solar Cells (operating Principles, Technology and System applications by Martin A.Green (Published by The University of New South Wales).
2. The Physics of Solar cells by Jenny Nelson (Published by Imperial college press)
3. Light-Induced Redox Reactions in Nanocrystalline Systems, Anders Hagfeldtt and Michael Gratzel, Chem, Rev.1995,95, 49-68.

Web link:

1.https://www.youtube.com/watch?v=YSRs3PuYT_k**.**
2.https://www.youtube.com/watch?v=DFj_0nZbzPw**.**
3.https://www.youtube.com/watch?v=Ks6pE6ksZ8o.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
II	22PPH2CCC2:2	SOLAR CELLS	5	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:54

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	54

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

PHYSICS PRACTICAL – II

MICROPROCESSOR AND C PROGRAMMING

Core Practical - II
Course Code: 22PPH2CP2
Hours / Week: 6
Credit: 3

Semester: II
Maximum Marks : 100
Internal Marks : 40
External Marks : 60

(Any TWELVE only - Choosing a minimum of six experiments from each part)

COURSE OUTCOMES

- Understand various technique and concepts in Electronics experiments
- Develop the skill in handling instruments
- Gaining Knowledge about the concepts in electronics
- Learn Arithmetic Programs
- Students will acquire hands on knowledge of programming practice in C

A. Microprocessor Experiments:

1. Perform 8 bit addition, subtraction using 8085 - with and without Carry.
2. Perform 8 bit multiplication and division using 8085.
3. Write an 8085 program to find16 bit addition, 2's complement and 1's complement subtraction.
4. Conversion from decimal to octal and hexa systems.
5. Conversion from octal, hexa to decimal systems.
6. Study of ADC interfacing (ADC 0809) with 8085.
7. Study of DAC interfacing (DAC 0900) with 8085.
8. Design the traffic control system using microprocessor interfacing.
9. Connect the stepper motor with a micro controller and verify the performance.
10. Write the programs for Arithmetic operations using microcontroller.

B. C Program Experiments:

1. Find the roots of algebraic equations with the help of Newton-Raphson method.
2. Write a program for least-squares curve fitting and Straight line fitting.
3. Solution of simultaneous linear algebraic equations – Gauss elimination method.
4. Solution of simultaneous linear algebraic equations – Gauss-Seidal method.
5. Write a program for Lagrange interpolation method.
6. Program for numerical integration by Composite Trapezoidal rule.
7. Program for numerical integration by Composite Simpson's rules.
8. Program for numerical differentiation by Euler method.
9. Solution of ordinary differential equations – Runge-Kutta 2nd order method.
10. Solution of ordinary differential equations – Runge-Kutta 4th order method.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22PPH2CP2		PHYSICS PRACTICAL - II			6			3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓		✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =48 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:20

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	20

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MICROPROCESSOR AND MICROCONTROLLER

Elective Course: II
Course Code: 22PPH2EC2:1
Hours / Week: 5
Credit: 4

Semesters: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

- Grasp the fundamentals of the Intel 8085 Microprocessor Architecture, memory mappingand data transfer schemes, know the addressing modes and perform Arithmetic operation andsorting of a given data
- know the architecture and memory organization of the Intel 8051 Microcontroller and the design of timers, counters and registers using it as well as understand the modes of operation and control
- learn the architecture, operating mode and addressing modes of Intel 8086
- learn the instruction set and assembly language programming for implementing arithmeticoperations and sorting of a given data set using Intel 8051
- know the various peripheral devices of Intel 8051and interfacing them

UNIT-I: MICROPROCESSORS 8085 ARCHITECTURE

Intel 8085 microprocessor: Introduction – Pin configuration- Architectureand its operations- Data - address buses –Register in 8085 - Machine cycles of 8085. Interfacing of memory and I/O devices. Instruction classification: number of bytes, nature of operations- Instruction format. Vectored and non-vectored interrupts–maskable and non-maskable interrupts.

UNIT-II: 8085 ASSEMBLY LANGUAGE PROGRAMMING

Instruction set: Data transfer operations - Arithmetic operations Logical operations – Branching and machine control operations. Addressing modes. Writing assembly language programs: Looping, counting and indexing. Counters and time delays - Stack - subroutine. Translation from assembly language to machine language.

UNIT-III: MICROPROCESSOR 8086

Intel 8086 microprocessor: Introduction – Architecture - Pin configuration–interfacing memory and devices- Operating modes: Minimum mode, Maximum mode. Memory addressing: 8-bit data from even and odd address bank, 16-bit data from even and odd address bank. Addressing modes. Interrupts: Hardware interrupts – Software interrupts – Interrupt priorities-Simple programs.

UNIT – IV: MICROCONTROLLER 8051 ARCHITECTURE AND PROGRAMMING

Introduction to microcontroller and embedded system. Difference between microprocessor and microcontroller. 8051 microcontroller : Pin configuration, Architecture and Key features. 8051. Data types and directives Instruction set: Data transfer instructions - Arithmetic instructions – Logical instructions- Branching instructions- Single bit instructions. Addressing modes. Simple programs using 8051 instruction se

UNIT – V: INTERFACING OF MICROPROCESSOR 8085

Basic concepts of programmable device - 8255 Programmable Peripheral Interface (PPI) – interface of ADC and DAC. 8257 Direct Memory Access (DMA) controller. Basic concepts of serial I/O and data communication – interface of 8251 Universal Synchronous Asynchronous Receiver Transmitter (USART).

BOOKS FOR REFERENCE:

1. Microprocessor Architecture, Programming and Applications with 8085/8080, Ramesh S. Gaonkar, New Age International 6th edition, 2013.
2. Microprocessors and Interfacing-Programming and Hardware, Douglas V. Hall, Tata McGraw Hill, 1993.
3. Microprocessors and Microcontrollers by A.P.Godse and D.A.Godse, Technical Publications, Pune.
4. Advanced Microprocessors and Interfacing, Badri Ram, Tata McGraw Hill, 2001.
5. The 8051 Microcontroller and Embedded systems, Muhammad Ali Mazidi and Janice Mazidi. Pearson Education, 2000.
6. The 8051 Microcontroller Architecture, Programming and Applications. Kenneth J. Ayala. Penram International publishing Pvt. Ltd., second edit, 1996.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22PPH2EC2:1		MICROPROCESSOR AND MICROCONTROLLER			5			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓	✓	✓	✓	✓	✓		✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 47, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:56

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	56

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTRONICS INSTRUMENTATION

Elective Course:II
Course Code: 22PPH2EC2:2
Hours / Week: 5
Credit: 4

Semester: II
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

- The student will be able to learn static characteristics of instruments.
- The student will be able to explain the fundamental ideas of dynamic instrumentation.
- The student will be able to understand the basic ideas transducer.
- The student will be able to learn moderate pressure.
- The student will be able to flow measurement.

UNITI: STATIC CHARACTERISTICS OF INSTRUMENTS

Types of errors – Static Performance Parameters – Accuracy, Precision, Resolution – Linearity – Hysteresis–Dead Band – Backlash – Drift – Impedance loading and Matching.

UNITII: DYNAMIC CHARACTERISTICS OF INSTRUMENTS

Dynamic Response: Periodic Input Harmonic Signal – First order – Second order system - Response to step input and transient input – Compensation networks.

UNITIII: ANALOG AND DIGITAL TRANSDUCERS

Analog transducers: Electrochemical – Potentiometric Resistive – Inductive –Capacitive – Piezo–Electric transducers – Digital transducers: Frequency Domain, Electromagnetic Frequency Domain – Opto – Electrical Frequency Domain– Vibrating StringTransducers.

UNITIV: TRANSDUCERS –I

Moderate Pressure: Manometers, Elastic Transducers – High Pressure measurement – Temperature measurements: Non – Electrical Methods –Bimetallic Thermometer – Liquid in Glass Thermometer – Pressure Thermometers –Electrical Methods: Electrical Resistance Thermometers

UNITV: TRANSDUCERS –II

Flow Measurement: primary or Quantity Meters – Positive Displacement Meters -Nutating Disc Meter – Sliding Vane Type – Lobed impeller meter – Acoustic Measurements – Sound Level Meter – Frequency Analysis of Noise Signal–Sound Intensity Measurements – Microphones – Capacitor Type–Electret Microphone –Piezoelectric Crystal Type – Electrodynamic Type.

BOOKS FOR STUDY:

1. Instrumentation Measurement and Analysis – B.C. Nakra & K.K .Chaudhry TMH NewDelhi, Third Edition, Seventh Reprint, 2011.

BOOKS FOR REFERENCE:

1. Measurement System – E.D. Doebelin Mc-GrawHill. (1990)
2. Principles of Industrial Instrumentation– Patranbis.D, TMH NewDelhi, 1976.

Web link:
1.https://www.youtube.com/watch?v=CzafQ5GWz4s**.**
2.https://www.youtube.com/watch?v=nSeW3R2hr1A.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
II	22PPH2EC2:2	ELECTRONICS INSTRUMENTATION	5	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:49

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	49

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

PHYSICS FOR EVERYONE

Non Major Elective: I
Course Code: 22PPH2NME1:1
Hours / Week: 3
Credit: 2

Semester: II
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOME:

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

- Apply Physics concepts in day-to-day lifeactivities.
- Appreciate the knowledge of light andsound.
- Use the concept of heat in variousmodes.
- Comprehendenergystorageandhowtouseitaselectricity.
- Acquire the knowledge on fundamental Physics ideas for diverse applications.

UNIT–IMATTER:

Structure of the atom – Bohr atom Model – Somerfield's Relativistic Atom Model – The Vector Atom Model – Coupling Schemes – Pauli Exclusion Principle – Bonding in Crystals – Ionic, Covalent, Metallic, Molecular, and Hydrogen Bond – Few simple crystalstructure.

UNIT–IILIGHT:

Light as an electromagnetic wave – Light velocity in various media – Polarization – Wavelength, Amplitude, Phase, Period, Frequency - Sources of Light – Huygen's principle – Interference, Reflection, Refraction, Diffraction, Scattering – Lenses – Concave, Convex – LED – Laser.

UNIT–IIISOUND:

Intensity - Loudness of Sound - Decibel - Free, damped and forced vibrations – Resonance – Reverberation – Absorption coefficient – Damping and Damping Materials – Piezo electric effect – Ultrasonic waves – Transducer, Production and Detection of ultrasonic waves.

UNIT–IVHEAT:

Modes of heat transfer – Conduction, Convection,Radiation – Effect of temperature onthermal conductivity of different solids, liquid and gases - General laws of heat transfer – Black and White body – Emissive power and emissivity,lawsofradiation– Planck'sConstant.

UNIT–V ENERGY:

Energy Resources – Conventional and Renewable Energy – Energy Conversion – Solar Energy – Solar thermal Applications – heating, cooling, desalination, drying, cooking, etc. – Photovoltaic conversion of solar energy, Types of solar cells –Biomass resources and their classification – Pyrolysis and liquefaction – Biodiesel production– Urbanwastetoenergyconversion.

REFERENCES:

1. R. Murugesan, *Modern Physics* (S. Chand, New Delhi,2018).
2. B. Lal and N. Subrahmanyam, *Heat, Thermodynamics and StatisticalPhysics* (S. Chand, New Delhi, 2008).
3. R. Murugesan, *Properties of Matter* (S. Chand, New Delhi,2017).
4. G. N. Tiwari, *Solar Energy: Fundamentals, Design, Modelling andApplications* (Narosa, New Delhi, 2016).
5. M. S. Longhair, *Theoretical Concepts in Physics* (Cambridge University Press, Cambridge,2020).
6. D. Franceschetti, *Principles of Physics* (Salem Press, New York,2016).
7. A. H. Cook, *Physics of the Earth and Planets* (Macmillan, London,1973).
8. B. Gutenberg, *Physics of the Earth's Interior* (Academic Press, Cambridge, 1986).
9. https://ocw.aprende.org/courses/physics/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22PPH2NME1:1		PHYSICS FOR EVERYONE			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓			✓		✓	✓	
CO4	✓		✓	✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 35, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:49

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	49

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

GEOPHYSICS

Non Major Elective: I
Course Code: 22PPH2NME1:2
Hours / Week: 3
Credit: 2

Semester: II
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

- The student will be able to explain about solar system and atmosphere, ionosphere etc.
- The student will be able to demonstrate geo referencing using GIS software and to test the contamination of ground water using geochemical method.
- The student will be able to describe about earthquakes and natural disaster Tsunami and its impacts
- The student will be able to learn about the earth in the presence of magnetic field and gravity
- The student will be able to know the radioactivity of the earth, can calculate the radioactive dating of rocks and minerals and thermal properties of the earth.

UNIT 1: PHYSICS OF THE EARTH

Introduction to Geophysics- Earth as a member of the solarsystem-Atmosphere-Ionosphere-Asthenosphere-Lithosphere-Hydrosphere and Biosphere-Meteorology-Oceanography and Hydrology.

UNIT 2: GEOPHYSICAL AND GEOCHEMICAL METHODS

Geophysical methods: Geo referencing using Arc GIS software-Electrical methods-Qualitative interpretation of Vertical Electrical Sounding curves –Preparing pseudo cross section for electrical resistivity data and interpretation. Geochemical methods: Introduction-Principles of ground water chemistry-Sources of contamination- Ground water quality analysis.

UNIT 3: INTRODUCTION TO SEISMOLOGY

The earth’s interior and crust as revealed by earthquakes-Rayleigh waves and Love waves-Elastic rebound theory-Continental drift-Earthquake magnitude and intensity-Horizontal seismograph and seismograph equation-Tsunami-Causes and Impacts-Tsunami warning systems.

UNIT 4: GEOMAGNETISM AND GRAVITY

Historical introduction –The physical origin of magnetism-Causes of the main field-Dynamo theory of earth’s magnetism-Gravitational potential-Laplace’s equation and Poisson’s equation-Absolute and relative measurements of gravity-Worden gravimeter.

UNIT 5: GEOCHRONOLOGY AND GEOTHERMAL PHYSICS

Radioactivity of the earth-Radioactive dating of rocks and minerals-Geological time scale-The age of the earth-Flow of heat to the surface of the earth –Sources of heat with in the earth-Process and heat transport and internal temperature of earth.

BOOKS FOR STUDY

1. Cook .A.H, Physics of the Earth and Planets, McMillanPress,London,1973.
2. Arthur W. Hounslow, Water quality data -Analysis and, Interpretation, Lewis publishers, Washington D.C.1995
3. G.P.Mahapatra,. Physical Geology, CBSPublishers, New Delhi,1994.

BOOK FOR REFERENCE

1. Garland, Introduction to Geophysics 11 edition, WBSaunder Company, London, 1979.
2. William Lowrie, Fundamentals of Geophysics, 11Edition, Cambridge press, UK.
3. Nils-Axel Morne, Geochronology-Methods and case studies, INTECH publications .
4. John Raferty, Geochronology –Dating and Precambriantime –The beginning of the world as we know it, Britannica Educational publishers, New York-2011.
5. Don L.Anderson, Theory of the Earth, Black well scientific Publications-UK, 1979

Web link:

1. https://en.wikipedia.org/wiki/Earth_science
2. https://en.wikipedia.org/wiki/Earth
3. https://www.youtube.com/watch?v=JGXi_9A__Vc
4. https://www.youtube.com/watch?v=-ZFmAAHBfOU
5. https://mangomap.com/gis-software
6. https://en.wikipedia.org/wiki/Earthquake
7. https://www.youtube.com/watch?v=GQQCvsxHtJo
8. https://www.youtube.com/watch?v=fQt6UaR8Fcw
9. https://en.wikipedia.org/wiki/Gravimeter
10. https://www.radioactivity.eu.com/site/pages/Earth_Heat.htm
11. https://www.youtube.com/watch?v=46MN_okpKbQ

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH2NME1:2		GEOPHYSICS			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:41

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	41

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTROMAGNETIC THEORY

Core Course: V
Course Code: 22PPH3CC5
Hours / Week: 6
Credit: 5

Semester: III
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After completion of this course the students will be able to explain the following

- Explains the fundamentals of electrostatics
- Brief out the various concepts of magneto statics
- Illustrates the application of electromotive force
- Describes the elementary ideas of electromagnetic wave
- Gives idea to apply the application of electromagnetic wave

UNIT -I: ELECTROSTATICS

Principle of superpositions -Coulomb's law; the electric field – line, flux and Gauss's Law in differential form - the electrostatic potential; conductors and insulators; Gauss's law - application of Gauss's law – curl of E - Poisson's equation; Laplace's equation – work and energy in electrostatics – Boundary conditions and uniqueness theorem–energy of a point charge distribution – energy of continuous charge distribution – induced charges – capacitors. Potentials: Laplace equation in one dimension and two dimensions – Dielectrics – induced dipoles – Gauss's Law in the presence of dielectrics.

UNIT- II: MAGNETOSTATICS

Lorentz force – magnetic fields – magnetic forces – currents – Biot-Savart Law –Study current – magnetic field of a study current-Force between current carrying conductors – divergence and curl of B – Ampere's Law – Electromagnetic induction - comparison of magneto statics and electrostatics – Magnetic vector potential. Magnetization: effect of magnetic field on atomic orbit – Ampere's Law in magnetized materials – ferromagnetism.

UNIT-III: ELECTROMOTIVE FORCE

Ohm's Law – electromotive force – motional emf –Faraday's Law –induced electric field – inductance – energy in magnetic field – Maxwell's equation in free space and linear isotropic media –continuity equation – Poynting theorem.

Electromagnetic waves in vacuum: Waves in one dimension – wave equation – sinusoidal waves – reflection and transmission – Polarization.

UNIT-IV: ELECTROMAGNETIC WAVES

Polarization of electromagnetic waves – The wave equation for E and B – Monochromatic Plan waves- energy and momentum in electromagnetic waves – electromagnetic waves in matters –TE waves in rectangular wave guides – the co-axial transmission line. Potentials: potentials and fields – scalar and vector potentials– Gauge transformation – Coulomb Gauge andLorentz Gauge – Lorentz force law in potential form.

UNIT-V: APPLICATION OF ELECTROMAGNETIC WAVES

Boundary conditions at the surface of discontinuity– Reflection and refraction of E.M waves at the interface of non – Conducting media– Kinematic and dynamic properties – Fresnel's equation – Electric field vector 'E' parallel to the plane of incidence and perpendicular to the

plane of incidence – Reflection and transmission co-efficient at the interface between two non–Conducting media– Brewster's law and degree of polarization – Total internal reflection.

BOOK FOR STUDY:

1. Introduction to Electrodynamics – David J. Griffiths, 4th Edition, Pearson.
2. Electromagnetic Theory and Electrodynamics, SathyaPrakash, KedarNathRamNath and Co, 2017.
3. Electromagnetics, B.B Laud, Wiley Eastern Company, 2000.
4. Fundamentals of Electromagnetic, Wazed Miah, Tata McGraw Hill, 1980.
5. Basic Electromagnetics with Application, Narayanarao, (EEE) Prentice Hall, 1997.

BOOKS FOR REFERENCE:

1. Fundamentals of Electromagnetic Theory, Third edition, Narosa Publishing House, New Delhi – John R.Reitz, Frederick J Milford and Robert W.Christy, 1998.
2. Classical Electrodynamics – J.D. Jackson, II Edition, Wiley Eastern Limited, 1993.
3. Electromagnetic Fields and Waves – P.Lorrain and D.Corson.
4. Electromagnetics , B.B Laud, Wiley Eastern Company, 2000.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH3CC5		ELECTROMAGNETIC THEORY			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓		✓		
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓	✓		✓	✓		✓	✓	
CO4	✓		✓	✓	✓	✓		✓		✓
CO5	✓	✓	✓		✓	✓		✓	✓	
Number of Matches(✓) =35 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:60

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	60

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

CONDENSED MATTER PHYSICS

Core Course: VI
Course Code: 22PPH3CC6
Hours / Week: 6
Credit: 5

Semester: IV
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After completion of this course the students will be able to explain the following

- Introduction to crystal system and X-ray diffraction methods.
- Discuss lattice vibrations and lattice heat capacity
- Explain dielectric and ferro electric properties
- Discussion on para, ferro and ferri-magnetic properties.
- Discussion on superconductivity.

UNIT I: STATES OF MATTER

Crystalline and amorphous - Unit cell – Cubic cell – Characteristics of cubic cells – Wigner Seitz cell- Bravais lattices - Symmetry point groups – Space groups – Reciprocal lattice (definition and properties) - Reciprocal lattice of SC, BCC, FCC and HCP lattices - Miller indices - Atomic scattering factor – Diffraction – Structure factor - X-ray diffraction - Laue equations - Interpretation of Bragg's equation - Ewald construction.

UNIT II: LATTICE VIBRATIONS AND THERMAL PROPERTIES

Vibration of monatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons – Lattice heat capacity – Einstein model – Density of modes in one-dimension and three-dimension – Debye model of the lattice heat capacity – Free electron Fermi gas: Drude model – Electrical conductivity, electronic heat capacity - Hall effect & thermionic power – Electron motion in periodic potential: energy bands in solids, metals, semiconductors and insulators.

UNIT III: DIELECTRICS

Defects and dislocations – Dielectrics: Internal electric field – Polarizability – Clausiusmosotti equation -Ferroelectric crystals and their types – Polarization catastrophe – Landau theory of phase transition: First and second order – Antiferro, pyro and piezoelectric crystals.

UNIT IV: MAGNETISM

Langevin theory of para magnetism - Quantum theory of para magnetism - Curie law – Ferromagnetism - Weiss molecular field theory - Domain theory - Anti ferromagnetism - Neel theory – Ferrimagnetism - Ferrites-spin waves - Experimental techniques to study magnetic properties.

UNIT V: SUPERCONDUCTIVITY

Occurrence of Superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – Coherence length – BCS theory– Flux quantization – Type I and Type II Superconductors – Josephson superconductor tunneling – DC and AC Josephson effect – SQUID – Recent developments in high temperature superconductivity – Application of superconductors.

BOOKS FOR STUDY

1. C. Kittel, Introduction to Solid State Physics, Wiley India Edition, New Delhi, 7th Edition, Reprint2008.
2. S. O. Pillai, Solid State Physics, New Age International, New Delhi, 2006.

REFERENCES

1. B.S. Saxena, R.C. Gupta & P.N. Saxena, Solid State Physics, PragatiPrakashan, Meerut.
2. J.P. Srivastava, Elements of Solid state physics, Prentice-Hall of India Pvt Ltd, New Delhi, Second Edition, 2006.
3. S.L. Kupta and V. Kumar, Solid State Physics, K. Naths Educational Publishers, Meerut, 2006.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH3CC6		CONDENSED MATTER PHYSICS			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓		✓	✓		✓				
CO4	✓	✓			✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches(✓) =38 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:66

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	66

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global

SPECTROSCOPY

CCC-III | Semester: III
Course Code: 22PPH3CCC3:1 | Maximum Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 | External Marks : 75

COURSE OUTCOMES

- Understand the basic knowledge of Microwave spectroscopy
- Describe the concept of infra-red spectroscopy
- Understand the basic knowledge of Raman spectroscopy
- Explain the Instrumentation and application of NMR and ESR
- Describe Nuclear Quadrupole interaction and its applications.

UNIT-I: MICROWAVE SPECTROSCOPY

Rotation of Molecules – Rigid Rotator(Diatomic Molecules)– Expression for theRotational Constant - Intensity of Spectral Lines – Effect of Isotopic Substitution - Molecular Parameters (Bond Length, Bond Angle, Bond energy,Dipole Moment) from Rotation Spectra – Techniques and Instrumentation– Microwave spectroscopy Applications.

UNIT II: INFRARED SPECTROSCOPY

Vibrational energy of a diatomic molecule- Infrared selection rules-Vibrating diatomic molecule-Diatomic vibrating rotator- Vibrations of polyatomic molecules-Fermi resonance-Rotation vibration spectra of polyatomic molecules-Normal modes of vibration in crystal-Interpretation of vibrational spectra-Group frequencies-IR spectrophotometer-Instrumentation-Sample handling techniques-Fourier Transform Infrared spectroscopy-Applications.

UNIT III: RAMAN SPECTROSCOPY

Introduction-Theory of Raman Scattering-Rotational Raman Spectra-Vibrational Raman Spectra-Mutual Exclusion principle-Raman Spectrometer-Sample handling techniques-Polarization of Raman scattered light-Structure determination using IR and Raman spectroscopy-Raman investigation of phase transitions-Resonance Raman Scattering-Nonlinear Raman Phenomena-Preliminaries-Hyper Raman Effect-Stimulated Raman Scattering-Inverse Raman Effect-Coherent Anti-Stokes Raman scattering– Applications of Raman spectroscopy.

UNIT IV: NUCLEAR MAGNETIC AND ELECTRON SPIN RESONANCE SPECTROSCOPY

Basic principles – Quantum theory of NMR - magnetic resonance – relaxation processes – chemical shifts – spin-spin coupling - Spectra and molecular structure – Fourier Transform NMR –Instrumentation – Applications.Basic principles – Quantum theory - g-factor – Nuclear Interaction and Hyperfine structure – Relaxation effects - Hyperfine interaction – line widths – ESRspectrometer – Instrumentation– applications.

UNIT V: NUCLEAR QUADRUPOLE RESONANCE AND MOSSBAUER SPECTROSCOPY

Basic theory - Nuclear Electric quadrupole interaction – Energy levels – Transition frequency – Excitation and Detection – Effect of magnetic field – Instrumentation – Applications.Mossbauer effect - recoilless emission and absorption - hyperfine interaction -

chemicalisomer shift - magnetic hyperfine and electric quadruple interactions– Instrumentation – applications.

BOOKS FOR REFERENCE:

1. Colin N. Banwell, Elaine M. McCash, Fundamentals of Molecular Spectroscopy (Fourth Edition), Tata McGraw-Hill Publishing Company Ltd, 1995.
2. J.D. Graybeal, Molecular Spectroscopy, McGraw-Hill, New York, 1988.
3. Hollas, Michael, Modern Spectroscopy (Fourth Edition) John Wiley, New York, 2004.
4. R.PStraughen, S.Walker, Spectroscopy Vols.I,II and III, Chapman & Hall, London, 1976.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH3CCC3:1		SPECTROSCOPY			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓	✓		✓	✓	✓		✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 74

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	07
2.	Regional	07
3.	National	07
4.	Global	74

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ASTROPHYSICS

Major Based Elective: III | Semester: III
Course Code: 22PPH3CCC3:2 | Max. Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 | External Marks : 75

COURSE OUTCOMES:

- Students understand the basic of our Galaxy like Earth, Moon and the Sun
- Acquire knowledge about the Coronal mass ejections in our star
- Distinguish about the temperature and the pressure distribution of the planet
- Differentiate the characteristics of the cosmology
- Comprehend about the different types of instrumentation use in the Astronomical research

Unit I: INTERACTION OF GALAXIES

Introduction –classification of galaxies –elliptical galaxies –barred spiral galaxies –spiral Galaxies- irregular Galaxies .Milky way galaxy – Galactic clusters- Differential galactic rotation- Rotation and mass distribution – rotation curve and Doppler shift- spiral structure in the milky way – optical tracers of spiral structure- radio tracers of spiral structure – Black hole.

Unit II: OUR STAR

Ordinary gases- solar absorption line spectrum – Physical properties of the Sun – Structure of the Sun – solar atmosphere – the active sun- sunspots- sunspots cycle- solar wind- solar prominences- Coronal mass ejections (CME_S) – Solar flares – space weather effects.

Unit III: THE EARTH AND MOON

The Atmosphere- magnetosphere- the moon-the lunar surface-the lunar interior- Eclipses-lunar Eclipse- Solar Eclipse –Temperature of a planet – Pressure distribution – temperature distribution.

Unit IV: COSMOLOGY

Introduction –cosmological models – Big bang theory –study state theory –Hubble's law – Olber's paradox – Interstellar Extinction –Dark matter.

Unit V: INSTRUMENTATION FOR ASTRONOMICAL

Telescope – elements of telescope –properties of the image – types of optical telescope (Refracting and Reflecting) and difference between refracting and reflecting telescope- Radio telescope – photographic photometry- photoelectric photometry- spectrophotometry.

BOOKS FOR STUDY

1 .A.Mujiber Rahman, Concepts of Astrophysics, Sci tech Publications (India) PVT.Ltd. Chennai, (2018).(Unit I to V)

BOOKS FOR REFERENCES

1. Nicholas A.Pananides, Introductory Astonomy, Addison wesly Publishing Co. London
2.BaidyanathBasu, An Introduction to Astrophysics, PHI Learning Pvt.Ltd, New Delhi.

Web link:
1.https://youtu.be/VYxYuaDvdM0
2.https://www.youtube.com/watch?v=3fGcaxZMUIQ
3.https://www.youtube.com/watch?v=RUmS2DwX5FU

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH3CCC3:2		Astrophysics			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓	✓		✓	✓	✓		✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 53

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	53

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

PHYSICS PRACTICAL – III

GENERAL PHYSICS AND ELECTRONICS II

Core Practical - III
Course Code: 22PPH3CP3
Hours / Week: 6
Credit: 3

Semester: III
Max. Marks : 100
Internal Marks : 40
External Marks: 60

(Any TWELVE only - Choosing a minimum of six experiments from each part)

COURSE OUTCOMES

- Understand various technique and concepts in electronics experiments
- Develop the skill in handling instruments
- Gaining Knowledge about the concepts in electronics
- Learn Forbe's method
- Understanding the characteristics of Laser diode
- Learn the different kinds of Ics
- Understanding gates and ICs

A.**General Physics Experiments:**

1. Find the resistivity of powdered samples by Four probe method.
2. Determination of carrier concentration and Hall coefficients in semiconductors.
3. Determination of magnetic susceptibility of liquid by Guoys method.
4. Determination of magnetic susceptibility of liquids by Quincke's method.
5. Determine the chemical composition of Brass.
6. Calculate the charge of an electron by spectrometer.
7. Find the refractive index of the transparent liquid at different wavelengths.
8. Determination of specific rotatory power of a liquid using polarimeter.
9. Determination of Rydberg's constant by studying Hydrogen spectrum.
10. Determination of coefficient of coupling by AC bridge method.
11. Find the thermal conductivity by Forbe's method.
12. Determination of Particle size using He-Ne Laser.
13. Study the characteristics of Laser diode.
14. Determination of dielectric loss using CRO.

B. Electronics Experiments

1. Construct the Universal gatesUsing NAND / NOR IC's
2. Verification of Demorgan's theorems and Boolean Expressions
3. Design and setup Astable and monostablemultivibrator using IC 555
4. Study the Characteristics of FET amplifier through CD and CS configuration.
5. Study the performance of dual regulated power supply
6. Study the Half and Full wave precision rectifier using IC 741
7. Study the characteristics of LDR
8. Study the function of multiplexer and demultiplexer
9. Study the function of decoder and encoder
10. Design and verify the truth table of Flip flops
11. Construct the Half adder and Full adder using only NAND & NOR gates and verify their truth tables.
12. Construct the Half subtractor and Full subtractor using only NAND & NOR gates and verify their truth tables.

13. Design and prove the working of Digital comparator using XOR and NAND gates
14. Construct and verify the BCD to seven segment display using IC 7447 and 7490
15. Study of counter using IC 7490 (0-9 and 00-99)

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
III	22PPH3CP2		PHYSICS PRACTICAL - III				6		3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =48 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 29

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	29

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

NUCLEAR AND PARTICLE PHYSICS

Elective Course: III
Course Code: 22PPH3EC3:1
Hours / Week: 6
Credit: 4

Semester: III
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

After completion of this course the students will be able to

- Explain the fundamentals of nuclear properties
- Illustrate the radioactivity process and their corresponding theories
- Brief out the various nuclear reactions and mechanisms behind it
- Understand the concept of accelerators and reactors
- Elaborate the elementary particles and the fundamentals of particle physics

UNIT I: BASIC NUCLEAR PROPERTIES

Properties of Nucleus - Nuclear size, shape, mass – Charge distribution – Spin and parity – Binding energy – Semi empirical mass formula – Nuclear stability – Mass parabola - Characteristics of nuclear forces- Nature of nuclear forces – Ground state of deuteron – Magnetic dipole moment of deuteron – Proton-neutron scattering at low energies, Scattering length, phase shift – Exchange forces – Meson theory.

UNIT II: RADIOACTIVE DECAYS

Alpha emission – Geiger-Nuttal law – Gamow theory – Neutrino hypothesis – Fermi theory of beta decay – Selection rules – Non-conservation of parity – Gamma emission – Selection rules - Interaction of charged particles and X-rays with matter – Basic principles of particle detectors – Ionization chamber – Proportional counter and G.M counters – merits and demerits– Solid state detectors – Scintillation and semiconductor detectors.

UNIT III: NUCLEAR REACTIONS AND NUCLEAR MODELS

Nuclear reaction - Q-values and kinematics of nuclear cross sections – Energy and angular dependence – Reciprocity theorem – Breit-Wigner formula – Compound nucleus – Resonance theory – Optical model – Shell model – Liquid drop model – Collective model.

UNIT IV: ACCELERATORS AND REACTORS

Cyclotron – Synchrocyclotron – Betatron – Synchrotron – Linear accelerators - Characteristics of fission – Mass distribution of fragments – Radioactive decay processes – Types of Nuclear Reaction - Fission cross section – Energy in fission – Bohr-Wheeler's theory of nuclear fission – Fission reactors – Thermal reactors – Homogeneous reactors – Heterogeneous reactors – Basic fusion processes - Characteristics of fusion – Solar fusion – Controlled fusion reactors.

UNIT V: PARTICLE PHYSICS

Production of new particles in high energy reaction - Classification of elementary particles - Fundamental interaction - Quantum numbers – Anti particles - Resonances - Law in production and decay process – Symmetry and conservation laws - Special symmetric groups – Gell-Mann Nishijima theory - Quark model - SU3 symmetry - Unification of fundamental interactions - CPT invariance and Applications of symmetry arguments to particle reaction - Parity non conservation in weak interaction - Relativistic kinematics.

BOOKS FOR STUDY

1. D.C. Tayal, Nuclear Physics, Himalaya Publishing House, Mumbai, 2004.
2. M.L. Pandya and R.P.S. Yadav, Elements of Nuclear Physics, KedarNath Ram Nath, 2004.

BOOK FOR REFERENCES

1. K. S. Krane, Introductory Nuclear Physics, John-Wiley, New York, 1987. 27
2. V. Devanathan, Nuclear Physics, Naroso Publishing House, 2006.
3. S. B. Patel, Nuclear Physics: An Introduction, Wiley-Eastern, New Delhi, 1991.
4. Bernard L. Cohen - Concepts of Nuclear Physics, Tata McGraw Hill Publishing Co., New Delhi.

Web link:

1. https://www.youtube.com/watch?v=7N3c5OREkDQ

2.https://www.youtube.com/watch?v=H7OipY8RzX0&list=PL0b6maW-5d1fvnUXykaaD0JPjEB0pTDF9

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22PPH3EC3:1		NUCLEAR AND PARTICLE PHYSICS			6			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓		✓			✓		✓		
CO4	✓				✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓		
Number of Matches(✓) =34 , Relationship: Moderate										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 80

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	80

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

PLASMA PHYSICS

Elective Course: III
Course Code: 22PPH3EC3:2
Hours / Week: 6
Credit: 4

Semester: III
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES:

- To understand the fundamental concept of plasma.
- To explain motion particle plasma.
- To understand the plasma oscillation.
- To learn plasma technique.
- To learn about applications of plasma.

UNIT I: FUNDAMENTAL CONCEPTS ABOUT PLASMA

Kinetic pressure in a partially ionized-mean free path and collision cross section-mobility of charged particles-Effect of magnetic field on the mobility of ions and electrons-Thermal conductivity-Effect of magnetic field-Quasi-neutrality of plasma Debye shielding distance-Optical properties of plasma.

UNIT II:MOTION OF CHARGED PARTICLES IN ELECTRIC AND MAGNETIC FIELD

Particle description of plasma- Motion of charged particle in electrostatic field- Motion of charged particle in uniform magnetic field- Motion of charged particle in electric and magnetic fields- Motion of charged particle in inhomogeneous magnetic field - Motion of charged particle in magnetic mirror confinement- motion of an electron in a time varying electric field-Magneto-hydrodynamics-Magneto-hydrodynamic equations - Condition for magneto hydrodynamic behavior.

UNIT III: PLASMA OSCILLATIONS AND WAVES

Introduction, theory of simple oscillations-electron oscillation in a plasma- Derivations of plasma oscillations by using Maxwell's equation - Ion oscillation and waves in a magnetic field - thermal effects on plasma oscillations - Landau damping - Hydro magnetic waves – Oscillations in an electron beam.

UNIT IV: PLASMA DIAGNOSTICS TECHNIQUES

Single probe method - Double probe method - Use of probe technique for measurement of plasma parameters in magnetic field-microwave method- spectroscopic method-laser as a tool for plasma diagnostics-X-ray diagnostics of plasma-acoustic method-conclusion.

UNITV: POSSIBLE APPLICATIONS OF PLASMA PHYSICS

Magneto hydrodynamic Generator-Basic theory-Principle of Working-Fuel in MHD Generator-Generation of Microwaves Utilizing High Density Plasma-Plasma Diode.

BOOKS FOR STUDY:

1. Plasma Physics-Plasma State of Matter-S.N.Sen, Pragati Prakashan, Meerut.
2. Principles of Plasma Diagnostics-I.H.Hutchinson
3. Plasma Diagnostic Techniques-R.H.Huddlestone & S.L.Leonard

BOOKS FOR REFERENCE:

1. Introduction to Plasma Physics-F.F.Chen, PlenumPress, London
2. Principles of Plasma Physics-Krall&Trivelpiece
3. Introduction to Plasma Theory-D.R.Nicholson
4. The Plasma State-J.L.Shohet
5. Introduction to Plasma Physics-M.Uman

Web link:

1.https://www.youtube.com/watch?v=yWvt_ZvJqfE.

2.https://www.youtube.com/watch?v=SpR0ZtWqtEc.

3.https://www.youtube.com/watch?v=gyKXP7m7MFw.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

semester	Code	Title of the Course				Hours		Credits		
IV	22PPH 3EC3:2	PLASMA PHYSICS				6		4		
Course outcomes (Cos)	Programme Outcomes					Programme specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches (✓) =47, Relationship:Very high										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 42

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	42

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

MOBILE PHONE SERVICING

Value Added Course: II
Course Code: 22PVAPH2:1
Hours / Week: -
Credit: 2

Semester: III
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand the basics of electronics.
- To know the software and hardware used in mobile phones.
- To study the method of trouble shooting and marketing.

COURSE OUTCOMES:

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

- Effectively manage small business enterprise
- Establish and run a Mobile Handset Repairing unit
- Repair and Diagnose the Problem of all kinds of faults in Mobile Phone handsets in Hardware as well Software and rectify the faults using tools and equipment and various software.
- Use appropriate tools, spares and software updates, conduct test for repairs,
- Ensure admittance of faulty handsets, prioritize and conduct repair activities in time to ensure customer satisfaction.

UNIT I: Basics and Basic Electronics

Basics of mobile communication - Study of Digital Electronics - Assembling and disassembling of various models of mobile phones - Study of various tools and equipment used in mobile phone repairs - Study of parts inside a mobile phone - Using a multimeter - Use of DC Power Supply (Jhatka machine).

UNIT II: Hardware Repair

Introduction and study of Printed Circuit Board (Motherboard) - Details of various components on the PCB - Testing of various parts and components - Study of different ICs (chips) used on the motherboard - How to recognize various ICs - Soldering & desoldering of components by using a soldering iron - Soldering & desoldering of components by using a rework station - Reheating and mounting of various BGA and SMD chips.

UNIT III: Software Repair

Detailed study of various faults arising due to corrupt software - Introduction of various flasher boxes and software - Flashing of various brands of handsets - Removing virus from infected phones - Unlocking of handsets through codes and/or software - Use of various secret codes.

UNIT IV: Basic and Advanced Troubleshooting

Fault finding, troubleshooting and repairing of various faults - Common repair procedure for hardware related faults - Common repair procedure for software related faults - Water damaged repair techniques - Circuit tracing, jumper techniques and solutions -

Troubleshooting through schematic diagrams - Use of internet for troubleshooting faults - Advanced troubleshooting techniques.

UNIT V: Additional Learning

Clearing of all previous doubts - Guidance to start and manage your own mobile repair center - Guidance to successfully work as a technician - Procuring tools, spare parts and accessories - Dealing with customers and distributors - Marketing your mobile phone repair business.

BOOKS FOR STUDY:

1. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand &Co. (2006).
2. The Complete Guide to Heat Gun for Cell Phone Repair byMuhammad Asif Azeemi.
3. A Complete Guide for Beginners and Professionals (Smartphones and Tablets Repairs) [Print Replica] Kindle Edition by Chukky Oparandu
4. Learn Cell Phone RepairbyMuhammad Asif Azeemi

BOOKS FOR REFERENCE:

1. Basic Electronics by B.L. Theraja, S. Chand & Co., (2008).
2. . Electronics by M. Arul Thalapathi, ComptekPublishers (2005).
3. Best 27 Mobile Phone Repair Free Books Online PDF DownloadbyMuhammad Asif Azeemi.

WEB LINK:

https://www.mobilerepairingonline.com/2020/04/mobile-repairing-shop.htmlhttps://www.mobilerepairingonline.com/2019/03/2019-phone-repair-pdf-free-download.html

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PVAPH2:1		MOBILE PHONE SERVICING			-			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 47, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course35

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	35

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

PHYSICS OF SPORTS

Core Course: II | Semester: III
Course Code: 22PVAPH2:2 | Maximum Marks: 100
Hours / Week: - | Internal Marks : 25
Credit: 2 | External Marks : 75

OBJECTIVES:

- To understand that sports as a demonstration of the physics concepts.
- To know the role physics plays in the sporting world around us.
- To study the physical quantities influence the performance, rules of the game, equipment, safety and best practices.

COURSE OUTCOMES:

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

- Demonstrate the ability to think critically
- Use appropriate concepts to analyze sports data, sporting situations and player performance using the lens of physics.
- Know to use appropriate mathematical techniques and concepts to obtain quantitative solutions to performance of athletes and athletic equipment using physics.
- Develop the ability to read, evaluate, and interpret numerical and general sports data
- Apply physical principles to real-world sporting situations communicate effectively the physical principles that are governing the motion.

UNIT I: Introduction

Units - dimensional analysis - significant figures - converting units - order of magnitude calculation - center of mass – vectors - scalars - trigonometry as applied to accuracy in sporting data.

UNIT II: Kinematics

One dimensional kinematics - motion of object from the runner – swimmer - Emphasis will be placed on position - velocity and acceleration of the athlete - 2D Kinematics Motion in two dimensions - motion of various balls in flight.

UNIT III: Newton's Laws of Motion and Applications

Newton's laws in athletics - Newton's Laws Applied in Football – baseball - swimming - lens of applied forces -Momentum and Collisions Linear momentum – impulse - conservation of linear momentum - elastic and inelastic collisions in several contact sports.

UNIT IV: Rotational Motion and Oscillations

Work - energy - power in powerlifting - football and nutrition - Rotational Motion - The role of rotational motion - the conservation of angular momentum - dancer to the procession of a football spiral - Oscillations Periodic and simple harmonic motion - sweet spot on a bat - heavy ropes.

UNIT V: Fluids and Gravity

Density – pressure - buoyancy - swimming gear - river rafting - deflate gate - Gravity Newton's law of universal gravitation - local gravity - the effects of gravity - redesigning sporting facilities based on local gravitation

BOOKS FOR STUDY:

1. The Physics of Sports1st Edition By Michael Lisa (2016)
2. Gold Medal Physics: The Science of Sports by Arthur john Eric Gogg

BOOKS FOR REFERENCE:

1. Active Physics: An Inquiry Approach to physics by Arthur Eisenkraft.
2. The Physics of Sports, American Institute of Physics

WEB LINK:

https:www.real-world-physics-problems.com/physics-of-sports.html
https://www.udemy.com/course/the-physics-of-sports

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22PVAPH2:2		PHYSICS OF SPORTS			-			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓		✓	✓		✓	✓		✓	✓
CO3	✓		✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 47

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	47

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

CRYSTAL GROWTH AND THIN FILM PHYSICS

Elective Course: VII
Course Code: 22PPH4CC7
Hours / Week: 6
Credit: 5

Semester: IV
Maximum Marks: 100
Internal Marks: 25
External Marks: 75

COURSE OUTCOMES

On completion of this course the student will be able to carry out

- Understand the Growth of crystals using several techniques such as Slow Evaporation Method
- Study the Melt Method, Physical Vapour Deposition (PVD) and Chemical Vapour Deposition (CVD) and Gel Growth
- Understand the preparation of thin films using various Physical and Chemical Methods
- Know the characterization of thin films using Scanning Electron Microscopy (SEM), Electron Probe Micro-analysis
- Understand the working of X-Ray Photo Electron Spectroscopy and Mass Spectroscopy

UNIT I: NUCLEATION

Introduction - Kinds of nucleation - Equilibrium stability and meta stable state -Ambient phase equilibrium – Super saturation – Classical theory of nucleation -Effect of soluble impurities on nucleation - Determination of solubility - Methods of induction period measurements - Steady state nucleation rate - Nucleation parameters.

UNIT II: LOW TEMPERATURE GROWTH TECHNIQUES

Solution Growth Technique: Low temperature solution growth: solution, solubility and super solubility – Expression of super saturation – Mier's T-C diagram - Constant temperature bath and crystallizer – Seed preparation and mounting - Slow cooling and solvent evaporation methods.

Gel Growth Technique: Principle – Various types – Structure of gel – Importance of gel – Experimental procedure: Chemical reaction method, Single and double diffusion method, Chemical reduction method, Complex and decomplexion method – Advantages of gel method.

UNIT III: MELT AND VAPOUR GROWTH TECHNIQUES

Melt technique: Bridgman technique - Basic process – Various crucibles design - Thermal consideration – Vertical Bridgman technique - Czochralski technique: Experimental arrangement – Growth process.

Vapour technique: Vacuum technology - Physical vapour deposition – Chemical vapour deposition (CVD) – Chemical vapour transport.

UNIT IV: PREPARATIVE TECHNIQUES OF THIN FILM

Physical methods: VacuumevaporationSputtering - Chemical methods: Spraypyrolysis, Electrochemicalmethod- Types ofelectrodes:Counter,Working, Reference electrode - Electro andelectroless coating– Sol-gelmethod: Dip coating- Spincoating.

UNIT V: CHARACTERIZATION TECHNIQUES

Structural: XRD: Single and Powder – Molecular: FTIR Spectroscopy – Functional group analysis – Optical: UV-Vis-NIR spectroscopy – optical constants: film thickness

measurements- Electrical: Four probe technique Dielectric: dielectric constant and dielectric loss – SEM –TEM– TEM with EDAX - Electrical conductivity – TGA.

BOOKS FOR STUDY

1. Brice J. C., Crystal Growth Process, John Wiley and Sons, New York, 1986.
2. P. Santhana Raghavan and P. Ramasamy, Crystal Growth, KRU Publications, 1st Edition.
3. A. Goswami, Thin Film Fundamentals, New Age International Publishers, 2008

BOOK FOR REFERENCES

1. Brice J.C., The growth of crystals from liquids, North Holland Publishing Company, Amsterdam, 1973.
2. Henisch H.K., Crystals in gels and Liesegang rings, Cambridge Univ. Press, USA, 1988.
3. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, Thin Film Fundamentals, CBS, Publishers and Distributors, New Delhi.
4. Kasturi L. Chopra, Thin film Phenomena, McGraw Hill Book Company, 1969.
5. Smith Donald. L, Thin Film Deposition, McGraw Hill, London, 1995.

Web link:

1. https://www.youtube.com/watch?v=Odw6fGFC6dY
2. https://www.youtube.com/watch?v=ev1EiLWgDIs

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22PPH4CC7		CRYSTAL GROWTH AND THIN FILM PHYSICS			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO4	✓	✓		✓	✓		✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =47 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 62

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	62

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

NANO SCIENCE AND NANO TECHNOLOGY

Core Course: VIII
Course Code: 22PPH4CC8
Hours / Week: 6
Credit: 5

Semester : IV
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES:

- Comprehend the Size Dependence of Properties of nano technology
- Identify about the chemical Potential, electric potential in Surface energy
- Training about the synthesis of Nanoparticles
- Identify about the special Nanomaterials
- Knowledge about the different types of Physical properties and electrical conductivity of Nanomaterials

UNIT I: INTRODUCTION TO NANOTECHNOLOGY

Introduction – emergence of nanotechnology –challenges in nanotechnology-quantum theory of Radiation-quantum theory of matter- Structure - Size Dependence of Properties- Crystal Structures - Face-Centered Cubic Nanoparticles - Tetrahedrally Bonded Semiconductor Structures - Lattice Vibrations.

UNIT II: PHYSICAL CHEMISTRY OF SOLID SURFACES

Surface energy- chemical Potential as a function of surface curvature-electrostatic stabilization-surface charge density- electric potential at the proximity of solid surface-van der waals attraction potential-Interaction between two particles: DLVO theory.

UNIT III: SYNTHESIS OF NANOPARTICLES

Nanoparticles through homogeneous nucleation-Fundamentals of homogeneous nucleation-subsequent growth of nuclei-growth controlled by diffusion-growth controlled by surface process-Nanoparticles through heterogeneous Nucleation-fundamentals of heterogeneous nucleation-synthesis of nanoparticles.

UNIT IV: SPECIAL NANOMATERIALS

Carbon fullerenes and nanotubes- carbon fullerenes-fullerene-derived crystals-carbon nanotubes-micro and mesoporous materials-ordered mesoporous structures-random mesoporous structures-crystalline microporous materials: zeolites.

UNIT V: PHYSICAL PROPERTIES AND ELECTRICAL CONDUCTIVITY OFNANOMATERIALS

Melting points and lattice constants-mechanical properties- optical properties- quantum size effects-surface scattering-change of electronic structure-quantum transport-ferroelectrics and dielectrics-super paramagnetism.

BOOKS FOR STUDY

1 .Guozhong Cao, Nanostructures and Nanomaterials synthesis, Properties and applications. Imperial College Press, London, 2004(Unit II to V)
2. SunipaRoy, Chandan Kumar Ghosh, Chandan Kumar Sarkar Nanotechnology Synthesis to Applications, 2018 by Taylor & Francis Group, LLC.(Unit I)

BOOKS FOR REFERENCES

1. Charles P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology, 2003 by John Wiley & Sons, Inc.
2. ThomasVarghese, K.M.Balakrishna, Nanotechnology An Introduction To Synthesis Properties And Applications Of Nanamaterials

Web link:

1.https://youtu.be/0MzIh7wkgMs.

2.https://www.youtube.com/watch?v=FyrdLheSz0o .

3.https://www.youtube.com/watch?v=YAu17j9y-cA.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

semester	code	Title of the Course				Hours		Credits		
IV	22PPH4CC8	NANO SCIENCE AND NANO TECHNOLOGY				6		5		
Course outcomes (Cos)	Programme Outcomes					Programme specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓	✓	✓	✓		✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓)=47,Relationship:Very high										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 43

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	43

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION

E/IBE : IV | Semester: III
Course Code: 22PPH4E/22PPH4IBC | Max. Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 | External Marks : 75

COURSE OUTCOMES

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.
- To understand the main aspects of Traction

UNIT I ILLUMINATION

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Various types of air-conditioning system and their Applications smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING

Role of electric heating for industrial Applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OFELECTRICALENERGY

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TEXT BOOKS:

1. Wadhwa, C.L. “Generation, Distribution and Utilization of Electrical Energy”, New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, “Art and Science of Utilisation of Electrical Energy”, Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, “Utilization of Electrical Energy in SI Units”, Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, “Utilization of Electric Power and Electric Traction”, S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
IV	22PPH4E/22PPH4IBC	ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION	6	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches (✓) = 46, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 34

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	34

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

NANOPHYSICS

Non Major Elective: NME-II
Course Code: 22PPH4NME2:1
Hours / Week: 3
Credit: 2

Semester: IV
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

- Students may gain knowledge of Nanomaterials and their merits
- Students learned about the fundamentals of Carbon nano structure
- Synthesis of Nanomaterials and various methods
- Understanding the experimental characterization techniques
- They would able to expand their knowledge on applications of nanomaterials

UNIT I: INTRODUCTION TO NANO AND TYPES OF NANOMATERIALS

Characteristics of Nano – Inflince of nano /macro size- classification- Moors Law - Size of effect in nano system –surface volume ratio- Historical perspective on nonmaterial – Classification of nonmaterial's–Need and origin of nano -- Nano and energetic -Top-down and bottom-up approaches – Introductory ideas of 1D, 2D and 3D nanostructured materials – Quantum wire – Quantum well - Exciton confinement in quantum dots.

UNIT II: CARBON NANOSTRUCTURES

Carbon molecules and carbon bond -- C60: Discovery and structure of C60 and its crystal - Superconductivity in C60 -- Carbon nanotubes: Fabrication – Structure – Electrical properties – Vibrational properties – Mechanical properties-Applications (fuel cells, chemical sensors, catalysts).

UNIT III: FABRICATION OF NANOMATERIALS

Synthesis of oxide nanoparticles by sol-gel method -- Electrochemical deposition method – Electrospinning method – Lithography -- Atomic layer deposition - Langmuir--Blodgett films -- Zeolite cages -- Core shell structures – Organic and inorganic hybrids.

UNIT IV: CHARACTERIZATION OF NANOMATERIALS

Principles, experimental set-up, procedure and utility of scanning electron microscopy (SEM), transmission electron microscopy (TEM), scanning tunneling microscope (STM) and scanning probe microscopy (SPM)-FE –SEM - HR –TEM - XPS - AFM.

UNIT V: APPLICATIONS

Molecular electronics and nanoelectronics – Nanorobots -- Biological Applications of nanoparticles -- Catalysis by gold nanoparticles – Band-gap engineered quantum devices -- Nanomechanics -- CNT emitters – Photoelectrochemical cells – Photonic crystals – Plasmon waveguides- Nano sensors - Fuel cells.

BOOKS FOR STUDY:

1. T.Pradeep et al., A Textbook of Nanoscience and Nanotechnology (Tata McGraw Hill, New Delhi, 2012).
2. R.W. Kelsall, I.W. Hamley and M. Geoghegan, Nanoscale Science and Nanotechnology (John-Wiley & Sons, Chichester, 2005).
3. G. Cao, Nanostructures and Nanomaterials (Imperial College Press, London, 2004).

4. C.P. Poole and F.J. Owens, Introduction to Nanotechnology (Wiley, New Delhi, 2003).

BOOKS FOR REFERENCE:

1. H.S. Nalwa, Nanostructured Materials and Nanotechnology (Academic Press, San Diego, 2002).
2. M. Wilson, K. Kannangara, G. Smith, M. Simmons, B. Raguse, Nanotechnology: Basic Science and Emerging Technologies (Overseas Press, New Delhi, 2005).

Web link:

1. https://www.youtube.com/watch?v=2bDf7JSRvf8

2. https://www.youtube.com/watch?v=lFYs3XDu4fQ

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22PPH4NME2:1		NANOPHYSICS			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 47, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 56

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	56

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,

ADVANCED MEDICAL PHYSICS

Non Major Elective: NME II
Course Code: 22PPH4NME2:2
Hours / Week: 3
Credit: 2

Semester : IV
Max. Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES:

Upon completion this course students should be able to

- The student will be able to study the different sources of non-ionizing radiations.
- The student will be able to know the various types of optical radiations like UV, IR etc.
- The student will be able to explain the laser and fiber optic instruments for mediphotonics.
- The student will be able to learn the properties and propagation of ultrasonic waves and also able to know the ultrasonic dosimetry.
- The student will be able to understand the applications of radio frequency and microwaves.

UNIT-1: REVIEW OF NON-IONISING RADIATION PHYSICS IN MEDICINE

Different sources of Non Ionising radiation-their physical; properties-first law of photochemistry- Law of reciprocity- - Electrical Impedance and Biological Impedance - Principle and theory of thermography – applications.

UNIT-2: TISSUE OPTICS

Various types of optical radiations - UV, visible and IR sources - Lasers: Theory and mechanism-Laser Surgical Systems-Measurement of fluence from optical sources - Optical properties of tissues – theory and experimental techniques-interaction of laser radiation with tissues –photothermal -photochemical – photoablation – electromechanical effect.

UNIT-3: MEDIPHOTONICS

Lasers in dermatology, oncology and cell biology - Application of ultrafast pulsed lasers in medicine and biology-Lasers in blood flow measurement - Fiber optics in medicine - microscopy in medicine - birefringence - Fluorescence microscope - confocal microscope - Hazards of lasers and their safety measures.

UNIT-4: MEDICAL ULTRASOUND

Production, properties and propagation of ultrasonic waves- Bioacoustics – Acoustical characteristics of human body- Ultrasonic Dosimetry - Destructive and nondestructive tests - Cavitation - Piezo electric receivers, thermoelectric probe – Lithotropy - High power ultrasound in theraphy

UNIT-5: RADIO FREQUENCY AND MICROWAVES

Production and properties - interaction mechanism of RF and microwaves with biological systems: Thermal and non-thermal effects on whole body, lens and cardiovascular systems – tissue characterization and Hyperthermia and other Applications-Biomagnetism - Effects - applications.

BOOKS FOR STUDY

Unit-1

1. S. S Martellucci and A. N. Chester, Laser Photobiology and Photomedicine, Plenum Press, New York, 1985.

Unit-2

1. Markolf H. Neimz, Laser-Tissue Interactions, Springer Verlag, Germany, 1996.

Unit-3 to Unit-5

1. S. S Martellucci and A. N. Chester, Laser Photobiology and Photomedicine, Plenum Press, New York, 1985.

REFERENCE

1. J. R. Greening, Medical Physics, North Holland Publishing Co., New York, 1999.
2. R. Pratesi and C. A. Sacchi, Lasers in Photomedicine and Photobiology, Springer Verlag,West Germany, 1980.
3. Harry Moseley, Hospital Physicists' Association, Non-ionising radiation: microwaves,
4. ultraviolet, and laser radiation, A. Hilger, in collaboration with the Hospital Physicists,Association, 1988

Web link:

1. https://www.youtube.com/watch?v=9TCK1Sa0_Vc
2. https://en.wikipedia.org/wiki/Thermography
3. https://en.wikipedia.org/wiki/Laser_surgery
4. https://www.indiamart.com/proddetail/co2-laser-surgical-system-3595170512.html
5. https://ilchiro.org/laser-safety-for-clinical-applications/
6. https://en.wikipedia.org/wiki/Laser_safety
7. https://grantome.com/grant/NIH/R01-HD021687-06
8. https://www.frontiersin.org/articles/10.3389/fbioe.2020.00025/full
9. https://www.youtube.com/watch?v=CY4roB9ZTEo
10. https://en.wikipedia.org/wiki/Biomagnetism

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	22PPH4NME2:2		ADVANCED MEDICAL PHYSICS			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 45

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	45

Green - Local, **Pink** - Regional, **Blue** - National, **Brown** – Global,

RESEARCH METHODOLOGY

Course: I | Semester: I
Course Code: 22MPPH1CC1 | Max. Marks : 100
Credit: 4 | Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To know about the different steps in doing a research problem
- ✓ To have a idea about data analysis through various test
- ✓ To understand the advanced analytical techniques

Unit I: Working on a Research Problem

Research Problem-Scientific research – Aim and motivation – Principles and ethics – Identification of research problem: Determining the mode of attack – Current status – Literature survey – Abstraction of a research paper – Access using Internet web tools – e-mail – Impact and usefulness of the research problem – Role of research guide – Guidance and rapport – Preparation and presentation of scientific reports – Power point and poster – Writing of synopsis, dissertation and thesis – Research ethics- Preparation for viva-voice.

Unit II: Mathematical Methods

Introduction to Mathematical Methods- Hypergeometric function – Confluent Hypergeometric function – Series solution of Gauss Hypergeometric equations – Elementary properties - Symmetry property – Differential and Integral representations – Linear transformation of Hypergeometric function - Elliptic functions and elliptic integrals - The Binomial, Poisson and Gaussian distributions – General properties and fitting experimental data-Applications.

Unit III: Data Analysis

Introduction – Statistical description of data - Mean , Variance, Skewness, Median, Mode – Distributions – Student's t-test, F-test, Chi-square test – Linear and rank correlations – Modelling data: Least-squares, Fitting data – Curve fitting-Graphical method.

Unit IV: High Performance Computing

High performance computing basics – Elements of Fortran 90/95 – Constants and variables – Arithmetic expressions – I/O statements – Logical expressions – Conditional and control statements - Arrays – Functions and subroutines – Format statements – Advanced features: Procedures, modules, recursive functions and generic procedures – Applications Software and Libraries: MATLAB, MATHEMATICA, GNUPLOT, LATEX, LAPACK, BLAS, and FFTW (basics only).

Unit V: Advanced Analytical Techniques

Analytical Technique – Principles of single crystal and powder X-ray diffraction, HR-XRD, Second harmonic generation(SHG)- FT-IR, Raman and UV-visible spectrometers – Applications -SEM, FESEM, EDAX, TEM, HR-TEM with SAED, XPS, AFM – Instrumentation – Sample preparation- different methods – Analysis of materials – Study of dislocation – Ion implantation uses.

References

1. J. Anderson, B.H. Durston and M. Poole, Thesis and Assignment writing, Wiley Eastern, New Delhi, 2nd Edition, 1994.
2. Rajammal Devadas, Hand Book of Methodology of Research, R.M.M. Vidyalaya Press, 1993.
3. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2nd Edition, 2008.
5. P. K. Chattopadhyay, Mathematical Physics, Tata McGraw Hill, New Delhi, 2007.
6. Yogandra Prasad Joshi, An Introduction to FORTRAN 90/95 syntax and Programming, Allied Publishers Private Limted, New Delhi, 2003.
7. V. Rajaraman and C. Siva Ram Murthy, Parallel computers – Architecture and Programming, Prentice Hall of India, New Delhi, 2006.
8. H. K. Dass, Mathematical Physics, S. Chand & Company, New Delhi, 7th Revised Edition, 2014.
9. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2013.
10. D. Mularidharao, A.V.N. Samy, D. Dharaneeswara Reddy, Instrumental Methods of Analysis, CBS Publishers, New Delhi, 2013.

Total Number of Topics Present in the course: 81

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	81

Green - Local- **Pink** - Regional- **Blue** - National- **Brown** – Global

ADVANCED PHYSICS

Course: II
Course Code: 22MPPH1CC2
Credit: 4

Semester: I
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To understand the different methods of preparation of crystal growth, nanomaterials and thin films
- ✓ To know about the linear and nonlinear oscillations
- ✓ To have an idea of various energy sources.

Unit I: Quantum Field Theory

Lagrangian field theory – Canonical quantization – Classical field equations – Hamiltonian formulation quantization of field – Non-relativistic field – System of Bosons – System of Fermions – Relativistic fields – Klein Gordon fields – Dirac fields.

Unit II: Crystal Growth and Thin Film Physics

Introduction-Nucleation – Spherical and cylindrical nucleation – Solution growth methods: Slow cooling, slow evaporation and temperature gradient methods - Melt growth: Bridgman method, Czochralski method – Thin film preparation: Physical methods: Thermal evaporation, Electron beam evaporation, Sputtering method - Chemical methods: Chemical bath deposition, Spray pyrolysis and its Applications.

Unit III: Nanomaterials

Introduction to nano technology - Importance of nanomaterials – Types of nanostructures (1D, 2D, 0D) – Top down approach – Bottom up approach - Sol-Gel and Precipitation technologies - Ball milling - RF plasma - Laser synthesis - Gas phase condensation - Sonochemical – Applications of Nanomaterials in Bio-Medical.

Unit IV: Nonlinear Dynamics

Introduction to Nonlinear Dynamics- Regular and Chaotic motions – Linear and nonlinear oscillators – Phase trajectories – Fixed points and limit cycles – Period doubling phenomenon and onset of chaos in Logistic map - Linear and nonlinear waves – Solitary waves – Numerical experiments of Kruskal and Zabusky – Solitons – KdV equation (no derivation) – One Solitons solution by Hirota's direct method and its Applications.

Unit V: Energy Sources

Introduction -Nuclear reactor principle – Nuclear fuel source – Nuclear Reaction-Enrichment – Energy production – Power and Breeder Reactors - Waste disposal – Safety measures - Prospects of renewable energy sources –Solar collector –types of air heat- Solar Cells : Solar cell parameter, characteristics, efficiency – Single crystal silicon solar cells – Polycrystalline silicon solar cells – Applications of solar energy: Water heating, Photo voltaics - Wind energy: Wind power, principle, generation, distribution, efficiency-Applications.

References

1. V.K. Thankappan, Quantum Physics, New Age International (P) Ltd. Publishers, 2nd Edition, New Delhi, 2006.
2. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York, 1986.
3. P. Santhana Raghavan and P. Ramasamy, Crystal Growth Processes and Methods, KRU Publications, Kumbakonam, 2007.
3. A. Goswami, Thin film Fundamental, New Age International (P) Ltd, New Delhi, 2006.
4. G. Cao, Nanostructures and Nanomaterials : Synthesis, Properties and Applications, World Scientific Publishing Co. Pvt. Ltd., Singapore, 2nd Edition, 2011.
5. M. Lakshmanan and S. Rajasekar, Nonlinear Dynamics, Narosa Publications, New Delhi, 2008.
6. D. Yogi Goswami, Principles of Solar Engineering, CRC Press, 3rd Edition, 2015.
7. G.D. Rai, Solar Energy Utilization, Khanna Publishers, 5th Edition, New Delhi, 2006.

Total Number of Topics Present in the course: 67

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	05
2.	Regional	05
3.	National	05
4.	Global	67

Green - Local- **Pink** - Regional- **Blue** - National- **Brown** – Global

TEACHING AND LEARNING SKILLS

Course: IV
Course Code: 22MPPH1CC4
Credit: 4

Semester: I
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To know the different parts of computer system and their functions
- ✓ To understand the operations and use of computers and common Accessories
- ✓ To develop different teaching skills for putting the content across to targeted audience

Unit I: Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT Applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II: Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III: Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video Applications on the Internet, interpersonal communication through the web.

Unit IV: Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V: Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing

Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References:

1. Bela Rani Sharma, Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi, 2007.
2. Don Skinner, Teacher Training, Edinburgh University Press Ltd., Edinburgh, 2005.
3. Jonathan Anderson and Tom Van Weart, Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, UNESCO, 2002.
4. Kumar K.I, Educational Technology, New Age International Publishers, New Delhi, 2008.
5. Mangal, S.K., Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana, 2002.

6. Michael D. and William, Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York, 2000.
7. Pandey S.K., Teaching Communication, Commonwealth Publishers, New Delhi, 2005.
8. Ram Babu A. and Dandapani S, Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad, 2006.
9. Singh V.K. and Sudarshan K.N., Computer Education, Discovery Publishing Company, New York, 1996.
10. Sharma R. A., Fundamentals of Educational Technology, Surya Publications, Meerut, 2006.
11. Vanaja. M. and Rajasekar S., Computer Education, Neelkamal Publications, Hyderabad, 2006.

Total Number of Topics Present in the course: 45

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	04
4.	Global	43

Green - Local- **Pink** - Regional- **Blue** - National- **Brown** – Global