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

Bachelor of Physics - UG Course Structure under CBCS

(For the candidates admitted from the academic year 2020-2021 onwards)

Semester	Part	CourseCode	Title of the Course	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
1	I	20UT1	Tamil – I (Ikkalailakkiyam, kavithai, sirukathai, urainadai, ilakkiyavaralaru)	6	3	3	25	75	100
1	II	20UE1	Communicative English – I	6	3	3	25	75	100
1	III	20UPH1CC1	Properties of matter and Sound	6	5	3	25	75	100
1	III	20UPH1CP1	Core Practical –I	3	3	3	40	60	100
1	III	20UMA1AC1:1	Mathematics I– Algebra calculus	5	3	3	25	75	100
1	III	20UPH1PE1	Professional English for Physical Science-I	2	2	3	25	75	100
1	IV	20UVE	Value Education	2	2	3	25	75	100
			Total	**30**	**21**	**-**	**-**	**-**	**700**
2	I	20UT2	Tamil – II (Idaikkalailakkiyam, puthinam, ilakkiyavaralaru)	6	3	3	25	75	100
2	II	20UE2	Communicative English II	6	3	3	25	75	100
2	III	20UPH2CC2	Mechanics	6	5	3	25	75	100
2	III	20UPH2CP2	Core Practical – II	3	3	3	40	60	100
2	III	20UMA2AC2:1	Mathematics II– Analytical Geometry (3D), Trigonometry and Fourier Series	5	3	3	25	75	100
2	III	20UPH2PE2	Professional English for Physical Science-II	2	2	3	25	75	100
2	IV	20UES	Environmental Studies	2	2	3	25	75	100
			Total	**30**	**21**	**-**	**-**	**-**	**700**
3	I	20UT3	Tamil – III (Kappiyailakkiyam, nadakam, ilakkiyavaralaru)	6	3	3	25	75	100
3	II	20UE3	Language Through Literature and Communicative Skills 1	6	3	3	25	75	100
3	III	20UPH3CC3	Heat and Thermodynamics	6	5	3	25	75	100
3	III	20UPH3CP3	Core Practical – III	3	3	3	40	75	100
3	III	20UCH3AC3	Allied Chemistry – I	4	3	3	25	75	100
3	IV	20UCH4AP1	Volumetric and Organic Analysis- Practical	3	-	-	-	-	-
3	IV		NME1	2	2	3	25	75	100

			Total	**30**	**19**	**-**	**-**	**-**	**600**
4	I	20UT4	Tamil – IV (Pazhantamililakkiyam, ilakkiyavaralaru, pothukatturai)	6	3	3	25	75	100
4	II	20UE4	Language Through Literature and Communicative Skills II	6	3	3	25	75	100
4	III	20UPH4CC4	Electricity and Electromagnetism	5	5	3	25	75	100
4	III	20UPH4CP4	Core Practical – IV	3	3	3	40	60	100
4	III	20UCH4AC4	Allied Chemistry –II	3	3	3	25	75	100
4	III	20UCH4AP1	Volumetric and Organic Analysis- Practical	3	3	3	40	60	100
4	IV		NME2	2	2	3	25	75	100
4	IV	20UPH4SBE1	SBE1 – Office Automation	2	2	3	25	75	100
			Total	**30**	**24**	**-**	**-**	**-**	**800**
5	III	20UPH5CC5	Optics and Spectroscopy	5	5	3	25	75	100
5	III	20UPH5CC6	Analog Electronics	5	5	3	25	75	100
5	III	20UPH5CC7	Atomic Physics	5	5	3	25	75	100
5	III	20UPH5CP5	Core Practical – V	4	3	3	40	60	100
5	III	20UPH5MBE1	Energy Physics	5	5	3	25	75	100
5	IV	20UPH5SBE2	SBE2 – Numerical Methods	2	2	3	25	75	100
5	IV	20UPH5SBE3	SBE3 – Electrical Appliances	2	2	3	25	75	100
5	IV	20USSD	Soft Skills Development	2	2	3	25	75	100
			Total	**30**	**29**	**-**	**-**	**-**	**800**
6	III	20UPH6CC8	Relativity and Quantum Mechanics	6	5	3	25	75	100
6	III	20UPH6CC9	Nuclear Physics	6	5	3	25	75	100
6	III	20UPH6CP6	Core Practical – VI	5	4	3	40	60	100
6	III	20UPH6MBE2	Microprocessor Fundamentals	6	5	3	25	75	100
6	III	20UPH6MBE3	Digital and Communication Electronics	6	5	3	25	75	100
6	V		Extension Activities	-	1	-	-	-	-
6	V	20UGS	Gender Studies	1	1	3	25	75	100
			Total	**30**	**26**	**-**	**-**	**-**	**600**
			Grand Total	**180**	**140**				**4200**

List of Allied Courses

Allied Course – I	Allied Course II
1.Mathematics	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	4
7	Allied Course Practical	2
8	Non-Major Elective	2
9	Skill Based Elective	3
10	Environmental Studies	1
11	Value Education	1
12	Professional English	2
13	Soft Skill Development	1
14	Gender Studies	1
15	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: 20UPH1CC1
Hours / Week: 6
Credit: 5

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

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 it's 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.

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 tosphericaland cylindricaldrops and bubbles- Experimental determination of surface tension - Capillary rise method - Variation of surface tension with temperature - Jaegar's 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 - Poiseuilles' formula - Experimental determination of co-efficient of viscosity of a liquid by Poiseuille's method - Ostwald's viscometer- Stoke's method - Variation of viscosity of a liquid with temperature.

UNIT IV: DIFFUSION& OSMOSIS

Diffusion of liquids – Graham's laws of diffusion in liquids – Ficks 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 – Lissajou'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. Murugeshan.R, Properties of Matter, S. Chand & Co Pvt. Ltd., New Delhi, 2012.(Unit - I, II,III&IV)
2. Subrahmanyam.N &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 REFERENCES

1. BrijLal&Subramaniam.N, Properties of Matter, Eurasia Publishing Co., NewDeihi, 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).

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

Semester	Code	Title of the Course	Hours	Credits
I	20UPH1CC1	PROPERTIES OF MATTER AND SOUND	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(✓) = 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
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	02
2.	Regional	02
3.	National	02
4.	Global	65

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

CORE PRACTICALS – I

Core Practical - I	Semester: I
Course Code: 20UPH1CP1	Max. Marks : 100
Hours / Week: 3	Internal Marks : 40
Credit: 3	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, rigidity modulus, coefficients of viscosity, surface tension of liquids, focal length of convex lens
- ✓ Analyse the relationship between various types of experiments
- ✓ verify the laws of transverse vibrations as well as the laws of propagation of light
- ✓ Analyse the relationship between various types of experiments
- ✓ Study the elastic behaviour of materials

Any **EIGHT** experiments

1. Non-uniform bending – Pin and Microscope method.
2. Uniform bending -Pin and Microscope method.
3. Uniform bending – Optic lever method.
4. Static torsion – Rigidity modulus
5. Sonometer – Verification of laws of transverse vibrations.
6. Surface tension and interfacial surface tension drop weight method.
7. Surface tension capillary rise method.
8. Stokes's method – viscosity of highly viscous liquid.
9. Torsional pendulum – η and I.
10. Spectrometer – determination of refractive index (μ) of glass prism.
11. Focal length and refractive index of convex lens

(UV method, in conduct and out of conduct method)

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

Semester	Code	Title of the Course				Hours			Credits	
I	20UPH1CP1	**CORE PRACTICALS – I**				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(✓) =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:11

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	11

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

MECHANICS

Core Course: II
Course Code: 20UPH2CC2
Hours / Week: 6
Credit: 5

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

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 centre 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, 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

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– 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 potential – Gravitational potential due to a point mass - Equipotential surface.

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 centre 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 Venturimeter – Euler's equation of unidirectional flow – Torricelli's theorem Bernoulli's theoremandapplications.

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, S.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).

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

Semester	Code		Title of the Course			Hours			Credits	
II	20UPH2CC2		MECHANICS			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(✓) = 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
Relatioship	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	01
2.	Regional	01
3.	National	01
4.	Global	60

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

CORE PRACTICALS – II

Core Practical - II | Semester: II
Course Code: 20UPH2CP2 | Max. Marks : 100
Hours / Week: 3 | Internal Marks : 40
Credit: 3 | 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, 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 **EIGHT** experiments

1. Young's Modulus Optic lever method
2. Young's modulus – cantilever method mirror and telescope
3. Coefficient of viscosity of highly viscous liquid
4. Meter Bridge – Specific Resistance of a material of a wire.
5. Compound pendulum – Determination of acceleration due to Gravity (g) and Radius of Gyration (k).
6. Sonometer - Determination of A.C Frequency using Brass wire.
7. Sonometer - Determination of A.C Frequency using Steel wire.
8. Surface tension of a liquid – Capillary rise method
9. Spectrometer – Determination of Refractive Index (μ) of hollow prism.
10. Focal length and refractive index of concave lens
    (UV method, in conduct and out of conduct Method)

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

Semester	Code	Title of the Course				Hours			Credits	
II	20UPH2CP2	CORE PRACTICALS – 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(✓) =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:10

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	10

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

HEAT AND THERMODYNAMICS

Core Course: III
Course Code: 20UPH3CC3
Hours / Week: 6
Credit: 5

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

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.

UNIT II: SPECIFIC HEAT

Specific heat equation, examples - Specific heat capacity of solid -Specific heat capacity of liquids - Dulong and Petit's law- Variation of specific heat and atomic heat with temperature – Einstein'sand 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 vapours – Experiment for latent heat ofvaporization.

UNIT V: STATISTICAL MECHANICS

Introduction – Phase space - Microstates and macrostates – 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 REFERENCES

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.

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

Semester	Code	Title of the Course	Hours	Credits
III	20UPH3CC3	HEAT AND THERMODYNAMICS	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(✓) =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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:59

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	59

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

CORE PRACTICALS – III

Core Practical - III	Semester: III
Course Code: 20UPH3CP3	Maximum Marks: 100
Hours / Week: 3	Internal Marks : 40
Credit: 3	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

Any **EIGHT** experiments

1. Determination of thermal conductivity of a bad conductor – Lee's disc
2. Characteristics of junction and Zener diodes
3. Emissive power of a surface – Spherical calorimeter
4. Joule's calorimeter – Specific heat capacity of liquid (Barton's correction)
5. Carey Foster's Bridge – R and ρ
6. Specific heat capacity of a liquid – Newton's law of cooling method.
7. Spectrometer – Grating - Normal incidence.
8. Determination of thermal conductivity of good conductor - Forbe's method
9. Newton's Rings - Determination of Radius of Curvature of a Convex Lens(R).
10. P.O. Box – Determination of temperature coefficient of a wire.

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

Semester	Code		Title of the Course			Hours			Credits	
III	20UPH3CP3		CORE PRACTICALS – III			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(✓) =44 , Relationship:										

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:10

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	10

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

MAINTENANCE OF ELECTRICAL APPLIANCES

Non Major Elective: I
Course Code: 20UPH3NME1
Hours / Week: 2
Credit: 2

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

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-Units - 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 –types- 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-Applications.

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-Advantages.

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.

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

Semester	Code	Title of the Course	Hours	Credits
III	20UPH3NME1	MAINTANANCE OF 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
Relatioship	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,

ELECTRICITY AND ELECTROMAGNETISM

Core Course: IV | Semester: IV
Course Code: 20UPH4CC4 | Maximum Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

COURSE OUTCOMES:

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

- ✓ understand fundamental laws of electricity and magnetism
- ✓ Learn different magnetic materials
- ✓ Understanding the basic measurements
- ✓ 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 –Intensity of Magnetization – Magnetic permeability – Susceptibility – Properties of para, dia, and ferromagnetic materials – Curie point - Curie temperature - Hysteresis – Retentivity – Coercivity – Experiment to draw B-Hcurve 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 – Damping correction - Ampere's circuital law - Carey Foster's bridge – Specific resistance – Potentiometer – Principle – Ammeter calibration-Calibration of low rangeand high range voltmeterusing 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

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

Semester	Code		Title of the Course			Hours			Credits	
IV	20UPH4CC4		ELECTRICITY AND ELECTROMAGNETISM			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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:68

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	01
3.	National	01
4.	Global	67

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

CORE PRACTICALS – IV

Core Practical - IV
Course Code: 20UPH4CP4
Hours / Week: 3
Credit: 3

Semester: IV
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 specific resistances of electrical conductors
- ✓ determination of magnetic field intensity and the horizontal component of earth's magnetic field
- ✓ find the current and voltage sensitivities of a galvanometer and calibrate a low range voltmeter
- ✓ Analyse the CRO
- ✓ Learn the construction of full wave rectifier

Any **EIGHT** experiments

1. Potentiometer – Ammeter calibration
2. Potentiometer – Temperature coefficient of R
3. Potentiometer – Calibration of low range voltmeter
4. Potentiometer - High range voltmeter calibration.
5. Figure of merit – Mirror Galvanometer
6. Transistor Characteristics – CE – configuration
7. Spectrometer – I-d curve
8. CRO – Study of wave forms – Lissajous figures – f determination
9. Construction of Full wave rectifier
10. Potentiometer - Internal Resistance of a cell.
11. 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
IV	20UPH4CP4	CORE PRACTICALS – IV	3	3

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓	✓	✓
	✓		✓	✓	✓	✓	✓	✓		
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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course:11

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	11

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

FUNDAMENTALS OF PHYSICS

Non Major Elective: II | Semester: IV
Course Code: 20UPH4NME2 | Maximum Marks: 100
Hours / Week: 2 | Internal Marks : 25
Credit: 2 | External Marks : 75

LEARNING OUTCOME

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

- ✓ Introduce some basic concept of Physics like measurement of physical quantities,
- ✓ Analyze the states of matter and its applications
- ✓ Understand the energies and energy sources to students studying other than Physics.
- ✓ Understand the different energy sources
- ✓ The study of phenomena interference, diffraction, and polarization laws

UNIT 1:

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

UNIT II:

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

UNIT III:

Kinds of energy-Potential energy – Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, Atomic and Nuclear energy, (Examples) – Conservation of energy.

UNIT IV:

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

UNIT V:

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

Book for Study

1. First Year B. Sc Physics – B.V. Narayan Rao, New Age International (P) Lt, 1998.

Reference Books :

1. Mechanics – D.S. Mathur – S.Chand& Co., 2002.
2. Properties of matter – D.S. Mathur – S. Chand & Co., 2002.
3. Properties of matter – Brijlal Subramanian – S. Chand & Co., 2006.

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

Semester	Code		Title of the Course			Hours			Credits	
I	20UPH4NME2		FUNDAMENTALS OF PHYSICS –I			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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 27

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	27

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

OFFICE AUTOMATION

Skill Based Elective: I
Course Code: 20UPH4SBE1
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 ofText
2. Bio data: Prepare aBio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer andHeaders.

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 fiveletters.

UNIT III: MS-EXCEL

1. Data sorting-Ascending and Descending (both numbers andalphabets)
2. Mark list preparation for astudent
3. Individual Pay Bill preparation.
4. Invoice Report preparation.
5. Drawing Graphs. Take your own table.

UNIT IV: MS-POWERPOINT

1. Create a slide show presentation for aseminar.
2. Preparation of OrganizationCharts
3. Create a slide show presentation to display percentage of marks in each semester for allstudents
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
III	20UPH4SBE1	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
Relatioship	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	0
2.	Regional	0
3.	National	0
4.	Global	24

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

OPTICS AND SPECTROSCOPY

Core Course: V
Course Code: 20UPH5CC5
Hours / Week: 5
Credit: 5

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

COURSE OUTCOMES:

On completion of the course the students will have:

- ✓ 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 Fresnels and Fraunhoffer methods
- ✓ Study the theories for production of polarization of light
- ✓ Understand the theory and application of microwave and infrared spectroscopy

UNIT I: GEOMETRICAL OPTICS

Fermat's principle - Dispersion of light - Dispersive power - Deviation without dispersion - Dispersion without deviation - Constant deviation prism - Constant deviation spectroscope – Aberration - Spherical aberration - Methods of minimizing spherical aberration - Chromatic aberration of a lens – Lateral chromatic aberration.

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).

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.

BOOK 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,TMH publishingco. 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

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

Semester	Code	Title of the Course	Hours	Credits
V	20UPH5CC5	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
Relatioship	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	02
2.	Regional	02
3.	National	02
4.	Global	61

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

ANALOG ELECTRONICS

Core Course: VI
Course Code: 20UPH5CC6
Hours / Week: 5
Credit: 5

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

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
- ✓ Analyse the characteristics of transistor and transistor biasing circuits
- ✓ Analyse 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 – Zener diode: 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 – Colpitt's 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 - Working and V-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 and Class B.

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).

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

Semester	Code		Title of the Course				Hours		Credits	
V	20UPH5CC6		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: 59

S.No	**Category (Local/Regional/National, Global)**	**No. of Topics covered**
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	59

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

ATOMIC PHYSICS

Core Course: VII
Course Code: 20UPH5CC7
Hours / Week: 5
Credit: 5

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

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: POSITIVE RAYS

Discovery-properties- analysis – Thomson's parabola method – Aston's mass spectrograph – Bainbridge's mass spectrograph – Dempster's mass spectrograph – Dunnington's method of determining e/m – Mass defect and Packing fraction.

UNIT III: 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-Critical Potentials– Sommerfield'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 IV: FINE STRUCTURE OF SPECTRAL LINES

Coupling schemes-L-S Coupling-j-j Coupling- Hund rules- magnetic dipole moment due to orbital motion of the electron- due to spin of the electron - Stern and Gerlach experiment-spin-orbit coupling-optical spectra-spectral terms-spectral notation- selection rules- intensity rules- interval rule-fine structure of sodium D line- hyperfine structure- Normal Zeeman effect- theory and experiment-quantum mechanical explanation - Larmor's theorem- Anomalous Zeeman effect- Paschen –Bach effect-Stark effect.

UNIT V: X-RAYS AND PHOTO ELECTRIC EFFECT

Production of X-rays – properties-absorption of X-rays – X-ray absorption edges- Bragg's law – Bragg's X-ray spectrometer –the powder crystal method –Laue's method – Rotating crystal method – Symmetry operations–X-ray spectra- continuous spectra- characteristic spectra-Moseley's law - importance–width of spectral lines-Doppler broadening-collision broadening-X-ray Detectors-scintillation detector-semiconductor detectors Compton effect- theory and experimental verification.

Photo Electric Effect: Laws of photoelectric emissions - Einstein's photoelectric equation-photoelectric cells-photo emissive cells-photovoltaic cells-photoconductive cells-Applications of photoelectric cells

BOOKS FOR STUDY

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co., New Delhi(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).

BOOK 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

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

Semester	Code	Title of the Course				Hours			Credits	
V	20UPH5CC7	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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 83

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	83

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

CORE PRACTICAL V

Core Practical – V
Course Code: 20UPH5CP5
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. Koenig's method – Uniform bending – Determination of Young's modulus.
2. Spectrometer i-i' curve.
3. Spectrometer – Small angle prism.
4. Spectrometer – Grating minimum deviation and dispersive power.
5. Spectrometer – Cauchy's constants.
6. Spectrometer – Fraunhofer lines.
7. Spectrometer – Hartmann's Formula.
8. FET Characteristics.
9. FET amplifier.
10. Hartley oscillator using transistor.
11. Colpitt's oscillator using transistor.
12. Op – Amp – Adder and Subtractor.
13. Op – Amp – Integrator and Differentiator.
14. Field along the axis of a coil – determination of M.
15. M and H – Absolute determination using deflection and vibration magnetometer.
16. Potentiometer – EMF of a thermocouple.
17. Potentiometer x of thermistor.
18. Anderson's bridge – AC self inductance of a coil.

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

Semester	Code	Title of the Course	Hours	Credits
V	20UPH5CP5	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
Relatioship	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
Course Code: 20UPH5MBE1
Hours / Week: 5
Credit: 5

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

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-properties of renewable energy source – 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 SYSTEMS

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 solarphotovoltaic systems - PV Powered fan – PV powered area - lighting system – A Hybrid System.

UNIT IV: BIOMASS ENERGY

Introduction-Biomass classification-Biomass resource - 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 REFERENCES

1. Chetan Singh Solanki, Solar Photvoltaics 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.

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

Semester	Code	Title of the Course				Hours			Credits	
V	20UPH5MBE1	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
Relatioship	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,

NUMERICAL METHODS

Skill Based Elective: II
Course Code: 20UPH5SBE2
Hours / Week: 2
Credit: 2

Semester: IV
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.

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
III	20UPH5SBE2	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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 30

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	10
4.	Global	30

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

ELECTRICAL APPLIANCES

Skill Based Elective: III
Course Code: 20UPH5SBE3
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 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, NewDelhi
2. The Hindu speaks on Science, Vol I & II, Kasturi Ranga 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
III	20UPH5SBE3	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
Relatioship	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,

RELATIVITY AND QUANTUM MECHANICS

Core Course: VIII
Course Code: 20UPH6CC8
Hours / Week: 6
Credit: 5

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

COURSE OUTCOMES:

On completion of the course the students will be able

- ✓ to gain knowledge in the concepts of special and theory of relativity
- ✓ to evolve ideas about dual nature of matter
- ✓ analyze postulates of quantum mechanics and wave function
- ✓ to recognize basic terms in Quantum Mechanics and different operator mechanism
- ✓ to Apply of Schrödinger's equation to micro system

UNIT I: RELATIVITY

Frames of reference, Galilean transformation - Michelson - Morley experiment -Postulates of special theory of relativity - Lorentz transformation, length Contraction, time dilation -Relativity of simultaneity, addition of velocities, variation of mass with velocity, Mass energy relation - Minkowski's four dimensional space -Elementary ideas of general relativity.

UNIT II: WAVE NATURE OF MATTER

Phase - group velocity - wave packet - expression of De Brogile's wave length, Davisson and Germer's experiment, G.P.Thomson's experiment, Heisenberg's uncertainty principle and its consequences– Energy time uncertainty relation.

UNIT III: SCHRODINGER EQUATION

Inadequacy of classical mechanics - Basic postulates of quantum mechanics -Schrodinger equation - Properties of wave function - Probability interpretation of wavefunction - linear operators - self adjoint operators - expectation value - commutativity and compatibility.

UNIT IV: ANGULAR MOMENTUM IN QUANTUM MECHANICS

Orbital angular momentum operators and their commutation relations - separation of three dimensional Schrodinger equationsinto radial and angular parts - Elementary ideas of spin angular momentum of an electron - Pauli matrices.

UNIT V: SOLUTIONS OF SCHRODINGER EQUATION

Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator and hydrogen atom.

BOOKS FOR STUDY

1. A Text book of Quantum mechanics by P.M.Mathews and S.Venkatesan, TataMcGraw - Hill, New Delhi(2005).
2. Quantum Mechanics by V.K.Thankappan, New Age International (P) Ltd.Publishers, New Delhi(2003).
3. Quantum mechanics by K.K.Chopra and G.C. Agrawal, Krishna PrakasamMedia(P) Ltd., SMeerut First Edition(1998).
4. Modern Physics by R. Murugeshan and KiruthigaSivaprasath, S. Chand &Co.,(2008).

BOOKS FOR REFERENCE

1. Mechanics and Relativity by BrijlalSubramanyam, S.Chand& Co., New Delhi, (1990).
2. Concepts of modern physics by A.Beiser. Tata McGraw - Hill, 5thedition, NewDelhi(1997).
3. Introduction to quantum mechanics by Pauling and Wilson, McGraw – Hill.
4. Quantum mechanics by A.Ghatak and Loganathan, Macmillan India Pvt. Ltd.

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

Semester	Code	Title of the Course	Hours	Credits
VI	20UPH6CC8	RELATIVITY AND QUANTUM MECHANICS	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(✓) =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: 34

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	34

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

NUCLEAR PHYSICS

Core Course: IX
Course Code: 20UPH6CC9
Hours / Week: 6
Credit: 5

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

COURSE OUTCOMES:

On completion of the course the students will have:

- ✓ Analyze the ideas of basics of nucleus and their energy
- ✓ Knowledge about decay processes and their outcomes.
- ✓ Understanding on the basics of nuclear physics that treats atomic nuclei as self-bound many-body quantum systems
- ✓ Analyze the nuclear detector and particle accelerators
- ✓ Basic interaction between the particles and cosmic rays

UNIT I: 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 II: 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 - Applications- Radio carbon dating- radio isotopes – uses.

UNIT III: NUCLEAR REACTIONS

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

UNIT IV: NUCLEAR DETECTORS AND PARTICLE ACCELERATORS

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

UNIT V: COSMIC RAYS AND ELEMENTARY PARTICLES

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

Elementary particles: Introduction-particles and antiparticles– Classification of elementary particles– mass spectra-antimatter-the fundamental interaction-elementary particle quantum numbers-conservation laws and symmetry-the quark model

BOOKS FOR STUDY

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

BOOKS FOR REFERENCE

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

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

Semester	Code	Title of the Course				Hours			Credits	
VI	20UPH6CC9	NUCLEAR 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(✓) = 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: 59

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	59

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

CORE PRACTICAL VI

Core Practical – VI
Course Code: 20UPH6CP6
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

- ✓ single stage RC coupled transistor amplifier, analog circuits using multivibrator
- ✓ logic gates and verify their truth tables simple
- ✓ Analyze the theorems
- ✓ simple arithmetic operations using Intel 8085 Microprocessor
- ✓ 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. Regulated power supply using Zener, Percentage of regulation.
2. Single stage – RC coupled amplifier – Transistor.
3. Emitter follower amplifier – Frequency response.
4. Astablemultivibrator.
5. Monostablemultivibrator.
7. Logic gates – AND, OR and NOT gates using discrete components – Truth table.
8. Universal gates NAND/NOR and basic gates from Universal gates.
9. Half Adder and Full Adder using logic gates
10. Half Subtractor and Full Subtractor using logic gates.
11. BCD to 7 segment decoder – 7 segment LED display.
12. Demorgan's theorem and Boolean algebra.
13. Flip flop using gates.
14. Construction of power amplifier.

Section –B – Microprocessor 8085& 'C' Programming

Any **FOUR** experiments only

15. 8-bit addition and 8-bit subtraction.
16. 8-bit multiplication and division.
17. Conversion from decimal to hexadecimal system.
18. Conversion from hexadecimal to decimal system.
19. C Programming for Simpson's rule.
20. C Programming for Trapezoidal rule

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

Semester	Subject Code	Title of the Course				Hours			Credits	
VI	20UPH6CP6	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
Relatioship	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 FUNDAMENTALS

Major Based Elective: II — Semester: VI
Course Code: 20UPH6MBE2 — Maximum Marks : 100
Hours / Week: 6 — Internal Marks : 25
Credit: 5 — External Marks : 75

COURSE OUTCOMES:

On completion of the course the students will have:

- ✓ to know the basic ideas on microprocessor, memory and I/O devices
- ✓ learn the arithmetic programs
- ✓ to be familiar with the basic concepts of microprocessor interfacing
- ✓ Understand the programme peripheral interface and instructions
- ✓ to acquire skills in the programming instruction sets of microprocessor

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)) .

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.

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).

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

Semester	Code		Title of the Course			Hours			Credits	
VI	20UPH6MBE2		MICROPROCESSOR FUNDAMENTALS			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(✓) =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
Relatioship	Very Poor	Poor	Moderate	High	Very High

Total Number of Topics Present in the course: 30

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	30

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

DIGITAL AND COMMUNICATION ELECTRONICS

Major Based Elective: III
Course Code: 20UPH6MBE3
Hours / Week: 6
Credit: 5

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

COURSE OUTCOMES:

On completion of the course the students will be able to

- ✓ Understand the structure of various number system and basic logic gates.
- ✓ To 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 -Ex-OR-Ex-NOR- 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 – Half adder -Half subtractor- Full adder- Full subtractor.

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

BOOKS FOR STUDY:

1. 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)

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

Semester	Code	Title of the Course	Hours	Credits
I	20UPH6MBE3	DIGITAL AND COMMUNICATION 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(✓) =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
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	02
2.	Regional	02
3.	National	02
4.	Global	54

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: 20UPH1AC1 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- 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 – 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 - Application – Efficiency of a Carnot's engine – Entropy –TS-diagram– 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 - 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 Outcomes	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: 59

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	59

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

ALLIED PHYSICS PRACTICAL

Allied Course: II (Practical) Semester: II
Course Code: 20UPH2AP1 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 – II

ALLIED PHYSICS – III

ELECTRICITY, ELECTRONICS, ATOMIC AND NUCLEAR PHYSICS

Allied Course: II
Course Code: 20UPH2AC2
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 – Wheatstone's network – Meter Bridge- condition for balance Carey-– Foster's bridge measurement of resistance – measurement of specific resistance –determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter.

Unit II: Electromagnetism

Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductanc Coefficient of CouplingA.C. Circuits – Mean value – RMS value – Peak value – LCR in series - 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 – 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 Compliment – 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: 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,

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.

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: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,

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.

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:19

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	19

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.

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:57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	57

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

Thanthai Hans Roever College (Autonomous) Elambalur, Perambalur – 621220
M.Sc. Physics – Course Structure under **CBCS**
(For the candidates Aamitted from the Academic year 2020-2021 onwards)

Semester	Course Code	Title of the Course	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
1	20PPH1CC1	Mathematical Physics - I	6	4	3	25	75	100
1	20PPH1CC2	Classical Mechanics and Relativity	6	4	3	25	75	100
1	20PPH1CC3	Thermodynamics and Statistical Mechanics	8	4	3	25	75	100
1	20PPH1CC4	Electronics	5	4	3	25	75	100
1	20PPH1CP1	Physics Practical – I	5	4	3	40	60	100
		Total	**30**	**20**	**-**	**-**	**-**	**500**
2	20PPH2CC5	Mathematical Physics - II	6	5	3	25	75	100
2	20PPH2CC6	Electromagnetic Theory	6	5	3	25	75	100
2	20PPH2CP2	Physics Practical – II	8	4	3	40	60	100
2	20PPH2EC1:1	Numerical methods and Programming	5	5	3	25	75	100
2	20PPH2EC2:1	Microprocessor and Microcontroller	5	5	3	25	75	100
		Total	**30**	**24**	**-**	**-**	**-**	**500**
3	20PPH3CC7	Quantum Mechanics	6	5	3	25	75	100
3	20PPH3CC8	Spectroscopy	6	5	3	25	75	100
3	20PPH3CP3	Physics Practical – III	8	4	3	40	60	100
3	20PPH3EC3:1	Crystal Growth and Thin film Physics	5	5	3	25	75	100
3	20PPH3EC4:1	Nonlinear Optics	5	5	3	25	75	100
		Total	**30**	**24**	**-**	**-**	**-**	**500**
4	20PPH4CC9	Condensed Matter Physics	6	5	3	25	75	100
4	20PPH4CC10	Nuclear & Particle Physics	5	5	3	25	75	100
4	20PPH4CP4	Physics Practical – IV	8	4	3	40	60	100
4	20PPH4EC5:1	Nanophysics	5	4	3	25	75	100
4	20PPH4PW	Project Work – Dissertation – 80 Marks; Viva – 20 Marks	6	4	-	-	-	100
		Total	**30**	**22**	**-**	**-**	**-**	**500**
		Grand Total	**120**	**90**	**-**	**-**	**-**	**2000**

List of Major based Elective Courses

Elective	Course Code	Title of the Course
Elective -1	20PPH2EC1:1 20PPH2EC1:2	1.Numerical methods and Programming 2.Numerical methods
Elective –2	20PPH2EC2:1 20PPH2EC2:2	1.Microprocessor and Microcontroller 2.Advanced Microprocessor
Elective - 3	20PPH3EC3:1 20PPH3EC3:2	1.Crystal Growth and Thinfilm Physics 2.Thin Film Physics
Elective - 4	20PPH3EC4:1 20PPH3EC4:2	1.Nonlinear Optics 2.Biophysics
Elective –5	20PPH4EC5:1 20PPH4EC5:2	1.Nanophysics 2.Nanoscience

Note:

Project : 100 Marks
Dissertation : 80 Marks
Viva Voce : 20 Marks

- Core Course - 10
- Core Practical - 04
- Elective Course - 05
- Project - 01

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: 20PPH1CC1
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 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.

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).

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,

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	20PPH1CC1	MATHEMATICAL PHYSICS – I	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

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CLASSICAL MECHANICS AND RELATIVITY

Core Course: II
Course Code: 20PPH1CC2
Hours / Week: 6
Credit: 4

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:

• Derivation of Euler Lagrange equations for a system of particles (D'Alembert'spriciple and Variational 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 - 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 – Applicationsof 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.

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

Total Number of Topics Present in the course: 46

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	46

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

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	20PPH1CC2		CLASSICAL MECHANICS AND RELATIVITY			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

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THERMODYNAMICS AND STATISTICAL MECHANICS

Core Course: III
Course Code: 20PPH1CC3
Hours / Week: 5
Credit: 4

Semester: I
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 – 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 models.

Total Number of Topics Present in the course: 55

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	55

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

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		
I	20PPH1CC3		THERMODYNAMICS AND STATISTICAL MECHANICS			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

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ELECTRONICS

Core Course: IV | Semester: I
Course Code: 20PPH1CC4 | MaximumMarks: 100
Hours / Week: 5 | Internal Marks: 25
Credit: 4 | 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-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) – Applications of CCDs - 555 timer – Description of the functional diagram – Mono stable operation – Applications of mono shots – Astable operation - Pulse generation.

Total Number of Topics Present in the course: 76

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	05
2.	Regional	05
3.	National	05
4.	Global	76

Green - Local, **Pink -** Regional, **Blue -** National, **Brown** – Global,**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	20PPH1CC4		ELECTRONICS			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(✓) =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

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PHYSICS PRACTICAL - I
GENERAL& ELECTRONICS PRACTICAL

Core Practical - I
Course Code: 20PPH1CP1
Hours / Week: 8
Credit: 4

Semester: I
MaximumMarks : 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 General Physics experiments

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

A. General 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. BH loop – Energy loss of a magnetic material – 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. Photoelectric effect (Planck's constant Determination

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. Characteristics of FET
18. Characteristics of UJT
19. Characteristics of SCR
20. Common source amplifier using FET
21. Common drain amplifier using FET
22. Relaxation oscillator using UJT (or) Op-amp

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,

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

Semester	Code		Title of the Course			Hours			Credits	
I	20PPH1CP1		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

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MATHEMATICAL PHYSICS – II

Core Course: V
Course Code: 20PPH2CC5
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

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).

Total Number of Topics Present in the course: 52

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	52

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

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	20PPH2CC5	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

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ELECTROMAGNETIC THEORY

Core Course: VI
Course Code: 20PPH2CC6
Hours / Week: 6
Credit: 5

Semester: II
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

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 –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.

Total Number of Topics Present in the course: 57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	57

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

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		
II	20PPH2CC6		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

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PHYSICS PRACTICAL - II
MICROPROCESSOR AND C PROGRAMMING

Core Practical - II
Course Code: 20PPH2CP2
Hours / Week: 8
Credit: 4

Semester: II
MaximumMarks : 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
- Various techniques and concepts in Electronics
- Learn Arithmetic Programs
- Students will acquire hands on knowledge of programming practice in C

A. Microprocessor Practicals

1. 8 bit addition, subtraction using 8085. (With and Without Carry)
2. 8 bit multiplication and division using 8085.
3. 16 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).
7. Study of DAC interfacing (DAC 0900).
8. Traffic control system using microprocessor interfacing.
9. Control of stepper motor using microprocessor interfacing.
10. Arithmetic programs using microcontroller.

B. Computer Practical (By C Language)

1. Roots of algebraic equations - Newton-Raphson method.
2. Least-squares curve fitting – Straight-line fit.
3. Solution of simultaneous linear algebraic equations – Gauss elimination method.
4. Solution of simultaneous linear algebraic equations – Gauss-Seidal method.
5. Interpolation – Lagrange method.
6. Numerical integration – Composite Trapezoidal rule.
7. Numerical integration – Composite Simpson's rules.
8. Numerical differentiation – Euler method.
9. Solution of ordinary differential equations – Runge-Kutta 2nd order method.
10. Solution of ordinary differential equations – Runge-Kutta 4th order method.

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,

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

Semester	Code		Title of the Course			Hours			Credits	
II	20PPH2CP2		PHYSICS PRACTICAL - II			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(✓) =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

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NUMERICAL METHODS AND PROGRAMMING

Elective Course: I | Semester: II
Course Code: 20PPH2EC1:1 | Maximum Marks : 100
Hours / Week: 5 | 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:

- Understand the concept of errors and the measurements
- Describes the concept of Numerical Integration
- Explains 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 - 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 – 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.

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.

Total Number of Topics Present in the course: 52

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	52

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

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.

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.

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

Semester	Code		Title of the Course			Hours			Credits	
II	20PPH2EC1:1		NUMERICAL METHODS AND PROGRAMMING			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

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MICROPROCESSOR AND MICROCONTROLLER

Elective Course: II
Course Code: 20PPH2EC2:1
Hours / Week: 5
Credit: 5

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

COURSE OUTCOMES

- Grasp the fundamentals of the Intel 8085 Microprocessor Architecture, memory mapping and 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 arithmetic operations 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- Architecture and its operations - 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 set.

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).

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,

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	20PPH2EC2:1	MICROPROCESSOR AND MICROCONTROLLER				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(✓) = 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

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QUANTUM MECHANICS

Core Course: VII
Course Code: 20PPH3CC7
Hours / Week: 6
Credit: 5

Semester: III
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 – 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	
III	20PPH3CC7		QUANTUM MECHANICS			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: 50

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	50

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

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SPECTROSCOPY

Core Course: VIII
Course Code: 20PPH3CC8
Hours / Week: 6
Credit: 5

Semester: III
Maximum Marks : 100
Internal Marks : 25
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, 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.

Total Number of Topics Present in the course: 73

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	07
2.	Regional	07
3.	National	07
4.	Global	73

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

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	20PPH3CC8		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

Prepared By **Checked By** **HOD**

PHYSICS PRACTICAL - III
SOLID STATE PHYSICS PRACTICAL

Core Practical - III
Course Code: 20PPH3CP3
Hours / Week: 8
Credit: 4

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

Any TWELVE only

COURSE OUTCOMES

Understand various technique and concepts in General Physics experiments

- Understand various technique and concepts in electronics experiments
- Develop the skill in handling instruments
- Various techniques and concepts in electronics
- Learn Forbe's method
- Understanding the characteristics of Laser iode

1. Four probe method – Determination of resistivity of powdered samples.
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. Determination of dielectric constant of a liquid by RF oscillator method.
6. Determination of wavelength and thickness of a film by using Michelson's interferometer.
7. Brass spectrum – Determination of composition.
8. Charge of an electron by spectrometer.
9. Polarizability of liquids by finding the refractive indices at different wavelengths.
10. Determination of wavelength of monochromatic source using biprism.
11. Determination of refractive index of liquids using biprism (by scale & telescope method).
12. Determination of specific rotatory power of a liquid using polarimeter.
13. Rydberg's constant using spectrometer.
14. Determination of coefficient of coupling by AC bridge method.
15. Magnetoresistance of powder samples using CE bridge.
16. Forbe's method of determining thermal conductivity.
17. Particle size determination using He-Ne Laser.
18. Laser diode characteristics.
19. Determination of dielectric loss using CRO.

Total Number of Topics Present in the course: 19

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	19

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

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

Semester	Code		Title of the Course				Hours		Credits	
III	20PPH3CP2		PHYSICS PRACTICAL - III				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(✓) =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

Prepared By **Checked By** **HOD**

CRYSTAL GROWTH AND THIN FILM PHYSICS

Elective Course: III
Course Code: 20PPH3EC3:1
Hours / Week: 5
Credit: 5

Semester: III
MaximumMarks: 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,PhysicalVapour Deposition (PVD) and Chemical Vapour Deposition (CVD) and Gel Growth
- Understand the preparation of thin films using various Physicaland Chemical Methods
- To 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 doublediffusionmethod,Chemical reduction method, Complex and decomplexion method – Advantages of gel method.

UNIT III: MELT AND VAPOUR GROWTH TECHNIQUES

Melt technique: Bridgman technique- Basicprocess– Various cruciblesdesign - Thermal consideration – Vertical Bridgman technique - Czochralskitechnique:Experimental arrangement – Growthprocess.

Vapour technique: Vacuumtechnology - Physicalvapour deposition – Chemical vapour deposition (CVD) – Chemicalvapour 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.

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Total Number of Topics Present in the course: 59

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	59

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

BOOKS FOR STUDY

1. Brice J. C., Crystal Growth Process, John Wiley and Sons, New York, 1986.
2. P. SanthanaRaghavan 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.

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

Semester	Code		Title of the Course			Hours			Credits	
III	20PPH3EC3:1		CRYSTAL GROWTH AND THIN FILM 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(✓) =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

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NONLINEAR OPTICS

Elective Course: IV
Course Code: 20PPH3EC4:1
Hours / Week: 5
Credit: 5

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

COURSE OUTCOMES

Having successfully completed the course, the student will be able to:

- Explain the fundamental theory of laser actions. Illustrate the working various type of lasers
- Describe the elementary ideas of nonlinear optics
- Elaborates the utilization of NLO phenomenon in multiphoton process.
- Understand the behavior of NLO materials
- Illustrates the application of Fiber Optics

UNIT I: LASERS

Fundamentals of Lasers – Gas lasers – He-Ne, Ar^+ ion lasers – Solid state lasers – Ruby – Nd:YAG, Ti sapphire – Organic dye laser – Rhodamine – Semiconductor lasers – Diode laser, p-n-junction laser and GaAs laser.

UNIT II: BASICS OF NONLINEAR OPTICS

Wave propagation in an anisotropic crystal – Polarization response of materials to light – Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching – Third harmonic generation – Terahertz -- Bistability – Self-focusing.

UNIT III: MULTIPHOTON PROCESSES

Two photon process – Theory and experiment – Three photon process – Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index -- Optical Kerr effect -- Foucault effect – Photorefractive, electronic and optic effects.

UNIT IV: NONLINEAR OPTICAL MATERIALS

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline –Semiorganics – Thoreau complex – Laser induced surface damage threshold.

UNIT V: FIBER OPTICS

Propagation of light in an optical fiber – Step – Graded index fibers – Wave propagation – Fiber modes – Single and multimode
fibers –Numerical aperture – Dispersion – Fiber bandwidth – Fiber losses - Scattering, absorption, bending, leaky mode and mode coupling losses – Attenuation coefficient -- Material absorption.

BOOKS FOR STUDY:

1. K.R. Nambiar, Lasers: Principles, Types and Applications (New Age Inter-national Publishers Ltd, New Delhi, 2014).
2. B.B. Laud, Lasers and Nonlinear Optics, 3rd Edn. (New Age, New Delhi, 2011).
3. R.W. Boyd, Nonlinear Optics, 2nd Edn. (Academic Press, New York, 2003).
4.G.P. Agarwal, Fiber-Optics Communication Systems, 3rd Edn. (John Wiley, Singapore, 2003).

BOOKS FOR REFERENCE:

1. W.T. Silvast, Laser Fundamentals (Cambridge University Press, Cambridge, 2003).
2. D.L. Mills, Nonlinear Optics – Basic Concepts (Springer, Berlin, 1998).

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

Semester	Code		Title of the Course			Hours			Credits	
III	20PPH3EC4:1		NONLINEAR OPTICS			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(✓) =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: 47

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	1
4.	Global	46

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

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CONDENSED MATTER PHYSICS

Core Course: IX
Course Code: 20PPH4CC9
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 – Applicationof superconductors.

Total Number of Topics Present in the course: 66

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	66

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

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
IV	20PPH4CC9	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

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NUCLEAR AND PARTICLE PHYSICS

Core Course: X
Course Code: 20PPH4CC10
Hours / Week: 5
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

- Explains the fundamentals of nuclear properties
- Illustrates the radioactivity process and their corresponding theories
- Briefs out the various nuclear reactions and mechanisms behind it
- Understand the concept of accelerators and reactors
- Elaborates 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.

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,

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.

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.

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

Semester	Code		Title of the Course			Hours			Credits	
IV	20PPH4CC10		NUCLEAR AND PARTICLE 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(✓) =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

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PHYSICS PRACTICAL - IV
ANALOG AND DIGITAL ELECTRONICS LAB

Core Practical - IV
Course Code: 20PPH4CP4
Hours / Week: 8
Credit: 4

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

Any TWELVE only

COURSE OUTCOMES

- Understand various technique and concepts in electronics experiments
- Develop the skill in handling instruments
- Various techniques and concepts in electronics
- Learn the different kinds of Ics
- Understanding gates and ICs

1. Logic gates – Universality of NAND / NOR gates Using IC's
2. Verification of Demorgan's theorems and Boolean Expressions
3. Astable and monostablemultivibrator using IC 555
4. FET amplifier (CD and CS configuration)
5. Phase shift network and Oscillator using IC 741
6. Construction of dual regulated power supply
7. Half and Full wave precision rectifier using IC 741
8. Characteristics of LDR
9. Digital to analog converter - R-2R method and Weighted method
10. Study the function of multiplexer and demultiplexer
11. Study the function of decoder and encoder
12. Flip flops
13. Half adder and Full adder (using only NAND & NOR gates)
14. Half subtractor and Full Subtractor (using only NAND & NOR gates)
15. Digital comparator using XOR and NAND gates
16. BCD to seven segment display
17. Study of counter using IC 7490 (0-9 and 00-99)

Total Number of Topics Present in the course: 17

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	17

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

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

Semester	Code		Title of the Course			Hours			Credits	
IV	20PPH4CP4		PHYSICS PRACTICAL - IV			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(✓) =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

Prepared By **Checked By** **HOD**

NANOPHYSICS

Elective Course: IV
Course Code: 20PPH3EC5:1
Hours / Week: 5
Credit: 5

Semester: III
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

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 dots -- 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).

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.

Total Number of Topics Present in the course: 46

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	46

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

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).

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

Semester	Code		Title of the Course			Hours			Credits	
IV	20PPH3EC5:1		NANOPHYSICS			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(✓) = 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

Prepared By **Checked By** **HOD**

RESEARCH METHODOLOGY

Course: I
Course Code: 20MPPH1CC1
Credit: 4

Semester: I
Max. Marks : 100
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.

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, 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

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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: 20MPPH1CC2
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 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: 20MPPH1CC4
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.

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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.
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10. Sharma R. A., Fundamentals of Educational Technology, Surya Publications, Meerut, 2006.
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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,