THANTHAI HANS ROEVER COLLEGE, PERAMBALUR – 621220
(AUTONOMOUS)
B.Sc. PHYSICS – COURSE STRUCTURE UNDER CBCS
(For the candidates admitted from the academic year 2018-2019 onwards)

SEMESTER	PART	COURSE CODE	COURSE	COURSE TITLE	HOUR/ WEEK	CREDIT	EXAM HOURS	CIA MARKS	UNI. EXAM MARKS	TOTAL MARKS
I	I	18UT1	Tamil Language Course – I	Part 1 Tamil Ikkala Ilakkiyam	6	3	3	25	75	100
	II	18UE1	English Language Course – I	English -I (Prose for effective Communication skills)	6	3	3	25	75	100
	III	18UPH1CC1	Core Course – I	Properties of matter and Acoustics	6	6	3	25	75	100
		18UPH2CP1	Core Practical – I	Practical –I	4	-	-	-	-	-
		18UMA1AC1:1	First Allied Course – I	Mathematics I– Algebra calculus	6	4	3	25	75	100
	IV	18UVE	Value Education	Value Education	2	2	3	25	75	100
					30	**18**				**500**
II	I	18UT2	Tamil Language Course-II	Part 1 Tamil Idaiikkala Ilakkiyam	6	3	3	25	75	100
	II	18UE2	English Language Course-II	English -II (Poetry for effective Communication skills)	6	3	3	25	75	100
	III	18UPH2CP1	Core Practical – I	Practical – I	3	3	3	40	60	100
		18UPH2CC2	Core Course-II	Mechanics and Relativity	4	6	3	25	75	100
		18UMA2AC2:1	First Allied Course-II	Mathematics II– Analytical Geometry (3D), Trignometry and Fourier Series	5	3	3	25	75	100
		18UPH2CC3	Core Course-III	Electrical Appliances-I	4	4	3	25	75	100
	IV	18UES	Environmental Studies	Environmental Studies	2	2	3	25	75	100
					30	**24**				**700**
III	I	18UT3	Tamil Language Course-III	Part 1 Tamil Kappiya Ilakkiyam	6	3	3	25	75	100
	II	18UE3	English Language Course-III	English -III (Short story and effective Communication skills)	6	3	3	25	75	100
	III	18UPH3CC4	Core Course-IV	Heat & Thermodynamics	6	6	3	25	75	100
		18UPH4CP2	Core Practical – II	Practical – II	3	-	-	-	-	-
		18UCH3AC3	Second Allied Course-I	Chemistry I	4	4	3	25	75	100
		18UCH4AP1	Second Allied Course-II (AP)	Allied Chemistry II – Practical	3	-	-	-	-	-
	IV	18UPH3NME1	Non Major Elective I - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	NME	2	2	3	25	75	100
					30	**18**				**500**
IV	I	18UT4	Tamil Language Course-IV	Part 1 Tamil Palantamil Ilakkiyam	6	3	3	25	75	100
	II	18UE4	English Language Course-IV	English -IV (One act play and effective Communication skills)	6	3	3	25	75	100

	III	18UPH4CP2	Core Practical – II	Practical – II	3	3	3	40	60	100
		18UPH4CC5	Core Course-V	Electricity, Magnetism and Electromagnetism	5	5	3	25	75	100
		18UCH4AP1	Second Allied Course-II (AP)	Allied Chemistry II – Practical	3	3	3	40	60	100
		18UCH4AC4	Second Allied Course -III	Allied Chemistry III	3	2	3	25	75	100
	IV	18UCH4MNE2	Non Major Elective II - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	NME	2	2	3	25	75	100
	IV	18UPH4SBE1	Skill based Elective-I	Desktop Publishing	2	2	3	25	75	100
					30	**23**				**800**

V	III	18UPH5CC6	Core Course-VI	Optics and Spectroscopy	5	5	3	25	75	100
		18UPH5CC7	Core Course-VII	Atomic & Nuclear Physics	5	5	3	25	75	100
		18UPH5CC8	Core Course-VIII	Analog Electronics	5	5	3	25	75	100
		18UPH5CP3	Core Practical – III	Practical III	4	3	3	40	60	100
		18UPH5MBE1	Major based Elective-I	Materials Science	5	5	3	25	75	100
	IV	18UPH5SBE2	Skill based Elective-II	Computational Science	2	2	3	25	75	100
		18UPH5SBE3	Skill based Elective –III	Electrical Appliances	2	2	3	25	75	100
		18USSD	Soft Skills Development	Soft Skills Development	2	2	3	25	75	100
					30	**29**				**800**
VI										
		18UPH6CC9	Core Course-IX	Elements of Classical & Quantum Physics	6	6	3	25	75	100
		18UPH6CC10	Core Course-X	Digital Electronics and Microprocessor	6	6	3	25	75	100
		18UPH6CP4	Core Practical – IV	Practical IV	5	4	3	40	60	100
		18UPH6MBE2	Major based Elective-II	Computer Programming in C	6	6	3	25	75	100
		18UPH6MBE3	Major based Elective-III	Opto electronics & Fiber optic communication	6	6	3	25	75	100
	IV	18UEA	Extension activities		-	1	-	-	-	-
		18UGS	Gender Studies		1	1	3	25	75	100
					30	**30**				**600**
				Total	**180**	**142**				**3900**

PROPERTIES OF MATTER AND ACOUSTICS

Core Course: I
Course Code: 18UPH1CC1
Hours / Week: 6
Credit: 6

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

Objectives

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

Unit I: Elasticity

Hooke's law - Stress-Strain - Stress-Strain diagram - 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: Beam- bending moment- Neutral axis - Cantilever - Expression for bending moment - 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 – Angle of contact - Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface - Application to spherical and cylindrical drops 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 - Stoke's method - Variation of viscosity of a liquid with temperature – Ostwald's viscometer.

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)
2. Subrahmanyam .N & Brij Lal, Waves & Oscillations, Vikas Publishing House Pvt. Ltd., New Delhi, 1994 (Unit-
IV).
3. Brij Lal & Subramaniam .N, Textbook of Sound, Vikas Publishing House, New Delhi, 1999 (Unit-V).

Books for References

1. Brij Lal & 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).

Total Number of Topics Present in the course:60

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

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

PRACTICALS - I

Core Practical - I
Course Code: 18UPH2CP1
Hours / Week: 4 (I) + 3 (II)
Credit: 3

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

Any **TWELVE** experiments

1. Non-uniform bending – Pin and Microscope method.
2. Uniform bending – Optic lever method.
3. Sonometer – Verification of laws of transverse vibrations.
4. Specific heat capacity of a liquid – Newton's law of cooling method.
5. Meter Bridge – Specific Resistance of a material of a wire.
6. Compound pendulum – Determination of Acceleration due to Gravity (g) and Radius of Gyration (k).
7. Sonometer - Determination of A.C Frequency.
8. Potentiometer - Internal Resistance of a cell.
9. Thermal conductivity of a bad conductor – Lee's disc.
10. Short and Long Focus Convex lens – Determination of Foal Length (f).
11. Deflection magnetometer - Tan C position - Moment of a bar Magnet
12. Newton's Rings - Determination of Radius of Curvature of a Convex Lens(R).
13. Spectrometer – Determination of Refractive Index (μ) of solid prism.
14. Spectrometer – Grating - Normal incidence.
15. P.O. Box – Determination of temperature coefficient of a wire.
16. Surface Tension and Interfacial Tension - by Drop Weight method.

Total Number of Topics Present in the course:16

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	16

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

MECHANICS AND RELATIVITY

Core Course: II
Course Code: 18UPH2CC2
Hours / Week: 4
Credit: 6

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

Objectives:

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

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 Bodies

Momentum of inertia-Dimensions units of Momentum of inertia - Kinetic energy of rotation – Theory of compound pendulum – Equivalent simple pendulum – Reversibility of centres of oscillation and suspension – Determination of g and radius of gyration of a bar pendulum – Period of oscillation of a Bifilar pendulum with and without parallel threads - Centre of mass – Velocity and acceleration of centre of mass – Determination of motion of an individual particle – System of variable mass – Equation for a motion of a Rocket – Conservation of linear and angular momenta.

Unit III: Gravitation & Centre of gravity

Gravitation: Kepler's law of Planetary motion – Newton's laws of gravitation – Deduction of Newton's law of gravitation from Kepler's law - Boy's method of determination of G – Poynting's method of determination of G -Variation of 'g' with latitude, altitude and depth.

Centre of Gravity: Centre of gravity of (a) solid tetrahedron, (b) solid hemisphere, (c) hollow hemisphere and (d) solid cone.

Unit IV: Centre of Pressure & Hydrodynamics

Centre of Pressure: Vertical rectangular lamina – Vertical triangular lamina - Vertical circular lamina - Atmospheric pressure and its variations with altitude.

Hydrodynamics: Equation of continuity of flow - Euler's equation for unidirectional flow - Torricelli's theorem - Bernoulli's theorem and applications - Venturimeter - Pitot's tube for liquids - Laws of floatation - Meta centre - Meta centric height of a ship.

Unit V: Relativity

Newtonian relativity - Galilean transformations – Michelson-Morley experiment and its importance – Einstein's special theory of relativity – Lorentz transformations and its interpretation – Consequence of Lorentz transformation – Length contraction, time dilation – Relativistic addition of velocities – Mass energy equivalence – Basic ideas of general theory of relativity.

Books for Study

1. Naryanamoorthy, Mechanics – Part – I & II, S. Chand Publications, New Delhi, 6th Edition, 2008 (Unit I to IV)

2. D.S. Mathur, Mechanics, S.Chand Publications, New Delhi, 2000 (Unit I to IV).

3. R. Murugesan, Modern Physics, S.Chand Publications, New Delhi, 2008 (Unit V).

Books for References

1. Brijlal Subramaniam, Mechanics and Relativity, S.Chand Publications, New Delhi, 5th Edition, 2010 (Unit I to IV).

Total Number of Topics Present in the course:55

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	55

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

ELECTRICAL APPLIANCES-I

Core Course: III
Course Code: 18UPH2CC3
Hours / Week: 4
Credit: 4

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

Objective:

- To have an idea about the safety precautions when installing
- To know about the different tools needed for installation and repair

UNIT – I

Resistance and its types – capacitance and its types – Principle of capacitor– Colour codes - inductance and its units – Transformers – Electrical Charge – Current – Electrical Potential.

UNIT – II

Ohm's law – Unit of ohm's law – Galvanometer, Ammeter, Voltmeter and Multimeter Analog and Digital - Electrical Energy – Power – Watt – kWh – Consumption and electrical power.

UNIT – III

AC and DC – Single phase and three phase connections – RMS and peak values, House wiring – Star and delta connection – overloading – earthing – short circuiting – Fuses – Colour code for insulation wires.

UNIT - IV

Inverter – UPS – generator and motor – types – different types of windings – circuit breaker- Electrical switches and its types.

UNIT – V

Electrical bulbs – Fluorescent lamps – Street Lighting – Flood lighting – Electrical Fans – Wet Grinder – Mixer – Water Heater – Storage and Instant types, electric iron box, microwave oven – Stabilizer, fridge.

Books for study:

1. A text book in Electrical Technology – B L Theraja – S chand & Co.
2. A text book in Electrical Technology – A K Theraja.
3. Performance and design of AC machines – M G Say ElBS Edn.

Total Number of Topics Present in the course: 43

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	8
2.	Regional	8
3.	National	8
4.	Global	43

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

HEAT AND THERMODYNAMICS

Core Course: IV
Course Code: 18UPH3CC4
Hours / Week: 6
Credit: 6

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

Objectives:

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

Unit I: Transmission of heat

Conduction process - Thermal conductivity - Measurement of thermal conductivity by Forbe's method and Lee's disc method for bad conductors - Thermal radiation - Stefan's law - Newton's law from Stefan's law - Experimental determination of Stefan's constant.

Unit II: Specific heat

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

Unit III: Thermodynamics

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

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.

Total Number of Topics Present in the course:54

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

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

ASTROPHYSICS

Non Major Elective: I
Course Code: 18UPH3NME1
Hours / Week: 2
Credit: 2

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

Objective:

- To study about origin of universe and its expansion
- To know about the nature of stars, earth and moon
- To study the application of telescope related to the space

Unit I: Universe

Contribution of Chinese, Indian and Islamic civilization to astronomy - Nobel prize to astronomers - Difference among astrology, astronomy and astrophysics - Origin of universe – Age of universe – Expansion of universe –Cosmic background radiation - Cosmic inflation – Formation of first galaxies and stars – String theory – Size of universe – Black holes, Dark energy – Different types of galaxies, Milky way, Nebula, Fate of the universe.

Unit II: Stars

Reason for the shining of star – Composition of stars – Shape of star – Number of stars in the galaxy – Measurement of stars luminosities – Measurement of star distance, Light years – Determination of mass of the stars – Size of the stars – Age of the stars – Evolution of stars – Supernova – Binary stars (double stars) – Constellation.

Unit III: Solar system

Formation of solar system – Age of Sun and Sun's future – Future of earth when the sun dies – Sun spots – Mass of the sun – Solar wind – Flight time of light from Sun to Earth – Brown dwarf – Pluto no longer a planet – comets.

Unit IV: Earth and Moon

Size of the earth – Measurement of mass of earth – Age of earth – Origin of water on the earth – Origin of oxygen in our atmosphere – Reasoning of seasons – Green house effect - Origin of moon – Dark areas on the moon – Lack of atmosphere in moon – waning / waxing of moon.

Unit V: Telescope

Difference between reflecting and refracting telescopes – Common optical telescope configuration – Measurement of the performance of a telescope – Shape and construction of telescope mirrors – Schmidt telescope – Resolving power of telescope - Atmosphere degradation of telescope image – Advantages of observation from space – Working of radio telescope – Working of gamma ray telescope.

Books for Study

1. MikhaliYaMarov, The Fundamentals of Modern Astrophysics, Springer, New York, 2015 (Unit I-V).
2. Pierre-Yves Bely, Carol Christian and Jean-Rene Roy, Question and Answer Guide to Astronomy, Cambridge University Press, First South Indian Edition, 2010 (Unit I-V).

Books for References

1. K.D. Abhyankar, Astrophysics Stars and Galaxies, Universities Press, India, 2001.
2. Wolfgang Kundt, Astrophysics, Springer, New York, 2nd Edition, 2005.

Total Number of Topics Present in the course:57

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

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

PRACTICALS - II

Core Practical - II
Course Code: 18UPH4CP2
Hours / Week: 3 (III) + 3 (IV)
Credit: 3

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

Any **TWELVE** experiments

1. Static Torsion – Determination of η
2. Torsional pendulum – η and I
3. Coefficient of viscosity of highly viscous liquid
4. Stoke's method – Viscosity of highly viscous liquid
5. Characteristics of junction and Zener diodes
6. Emissive power of a surface – Spherical calorimeter
7. Joule's calorimeter – Specific heat capacity of liquid (Barton's correction)
8. Carey Foster's Bridge – R and ρ
9. Potentiometer – Ammeter calibration
10. Potentiometer – Temperature coefficient of R
11. Potentiometer – Calibration of low range voltmeter
12. Figure of merit – Mirror Galvanometer
13. Transistor Characteristics – CE – configuration
14. Spectrometer - μ of a liquid
15. Spectrometer – I-d curve
16. CRO – Study of wave forms – Lissajous figures – f determination
17. Construction of Full wave rectifier
18. Construction of a temperature controller using Pt 100 senor

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,

ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Core Course: V
Course Code: 18UPH4CC5
Hours / Week: 5
Credit: 5

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

Objectives:

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

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 – 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 potential – 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-H curve by magnetometer method – Loss of energy per cycle.

Unit III: Electric current and electrical measurements

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

Unit IV: Electromagnetic induction

Laws of electromagnetic induction – 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 – 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 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.

Books for Study

1.R. Murugesan, Electricity and Magnetism, S.Chand& Co., New Delhi, 2008 (Unit I to V).

2. Brijlal and Subramaniyam, Electricity and Magnetism, S. Chand & Co., New Delhi, 1983 (Unit I to V).

References

1. Edward M. Purcell & David J. Morin, Cambridge University Press, 3rd Edition, 2013.

Total Number of Topics Present in the course:63

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	01
3.	National	01
4.	Global	62

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

MEDICAL PHYSICS

Non Major Elective: II
Course Code: 18UPH4NME2
Hours / Week: 2
Credit: 2

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

Objectives:

- To acquire knowledge about Human Mechanics
- To study the structure and functions of eye and ear
- To bring out the basic ideas of laser and ultrasonics in medicine

Unit I: Human Mechanics

Introductory anatomy: Muscles and Skelton – Forces and levers – Solving lever problems – Vertebral column - Standing, Bending and Lifting – Walking and running – Energy expenditure – Energy income.

Unit II: The Eye and Ear

The eye and vision – Structure and function of the eye – Response system – Social implications of colour perception – The optical system, the optical defect and their corrections – The ear and hearing and structure and function of ear – The transmission and measurement of sound – The ear response – Defect of hearing.

Unit III: Instrumentation and Electrical Signals

System – Transducers – Display devices - transmission methods – Computer and Electrical signals – Biopotentials – The cardiovascular system - Electro cardiography – Other electrical potential measurements – Electrical theraphy.

Unit IV: Pressure and Optics

Measuring Pressure – Blood pressure – Invasive Measurements – Optics: Fibre optics – Endoscopy –Laser: Principle, Properties, General Applications – Laser in Surgery.

Unit V: Ultrasonics Medicine and Diagnostic Devices

Generation and detection of ultrasound – Ultrasound in the body – Scanning and imaging – Doppler methods – Physiological effects of ultrasound - Development in ultrasound – X-rays: The nature of X-radiation – Interaction of X-rays equipment – Use of X-rays in diagnosis – Radiotherapy.

Books for Study

1. Martin Hollins, Medical Physics, Nelson Thomsom Ltd, Second edition, 2001 (Unit I-V).

Books for Reference

1. B.H. Brown,R.H. Smallwood, D.C. Barber, P.V. Lawford, D.R. Hose, Medical Physics and Biomedical Engineering, New York , 1999.
2. Applied Laser Medicine, Hans Peter Berlien Gerhard J. Muller,2003.
3. Peter Hoskins, Kevin Martin and Abigail Thrush, Diagnostic Ultrasound Physics and Equipment, Cambridge University, 2010.

Total Number of Topics Present in the course:44

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	44

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

DESKTOP PUBLISHING

Skill based elective: I
Course Code: 18UPH4SBE1
Hours / Week: 2
Credit: 2

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

Objectives:

- To have a basic understanding about MS office to work with documents
- To know about the photoshop to make the text effects
- To study about the printing and publishing formats

Working with documents - Opening and saving files, Editing text documents - Formatting documents - Header and footer - Creating tables - Inserting clip arts - Tools.

Multimedia: Introduction to multimedia - Color models - Multimedia presentation - Images, pictures, text, animation, audio, video.

Unit II: Photoshop

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

Unit III: Corel Draw

Corel draw – Menus and tools - Drawing – lines, shapes – Inserting pictures (objects, tables, templates) - Inserting symbols & Clip arts.

Unit IV: Page Maker

Page maker - Basics menus & tools - Guides & rulers - Drawing tools - Fills & outlines - Working with - text, paragraphs, graphics, tables.

Unit V: Printing and Publishing

Introduction - Letterpress printing – lithography - offset printing - machines for letterpress - screen printing - printing materials - Page setting, character & paragraph formatting.

Books for Study

1. Prabhat K Andleigh Kiran Thakrar, Multimedia systems design, Prentice Hall of India, New Delhi, 2005 (Unit I).

2. MS-Office and Internet by Alexis Leon (Unit I).

3. Comdex Multimedia and Web Design Course Kit, Vikas Gupta & Kogent Solutions Inc. Dream Tech. Press, 2008 (Unit II & III).

4.Carolyn M Connally, Pagemaker 7, Dream Tech, New Delhi, 2005 (Unit IV).

5. G. S. Jolly, Book Publishing Management, Har Anand Pub., New Delhi, 2009 (Unit V).

Books for References

1. Judith Jeffcoate, Multimedia in Practice: Technology and Practice, Pearson Education, 2007.

2. Steve Romaniello, Photoshop 6, Steve Romaniello, BPB Pub. New Delhi, 2001.

Total Number of Topics Present in the course: 39

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	39

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

OPTICS AND SPECTROSCOPY

Core Course: VI | Semester: V

Course Code: 18UPH5CC6 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

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

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

Colour of thin films - Fresnel's biprism - Fresnel's mirrors and Lloyd'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 - Missing orders in double slit - Theory of diffraction grating .

Unit IV: Polarization

Polarization -Double refraction - Nicol prism - Polarizer & 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. R. Murugesan, Kiruthiga Sivaprasath, Optics and Spectroscopy, S. Chand & Company Ltd., New Delhi, 25th Revised Edition, 2005 (Unit I to V).
2. Subrahmanyam, Brijlal and M. N. Avadhanulu, A Text Book of Optics, S. Chand, New Delhi, 23rd Edition, 2004 (Unit I to V).

References

1. H.R. Gulati, Fundamentals of Optics, S. Chand & Co., New Delhi, 1984.
2. Ajoy Chatak, Optics, Tata-McGraw-Hill publications, 2009.

Total Number of Topics Present in the course:58

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	58

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

ATOMIC AND NUCLEAR PHYSICS

Core Course: VII
Course Code: 18UPH5CC7
Hours / Week: 5
Credit: 5

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

Objectives:

- To understand about the cathode and anode rays by means of different methods
- To know about the vector atom and nuclear models
- To study the classification of various quantum numbers

Unit I: Cathode Rays and positive rays

Cathode rays – Properties – e/m of cathode rays – Millikan's oil drop method – Positive rays – Properties – e/m of Positive rays: Thomson's parabola method – Aston's, Bain bridge's mass spectrograph - Determination of critical Potential – Franck and Hertz's experiment - Davis and Goucher's method.

Unit II: Vector Atom model

Various quantum numbers –L-S and j-j Couplings – Pauli's exclusion principle – Electronic configuration of elements and periodic classification – Magnetic dipole moment of electron due to orbital and spin motion – Bohr magnetron - Stern and Gerlach experiment.

Unit III: Fine structure of spectral lines

Special terms and notations – Selection rules - Intensity rule and interval rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra – Spectrum of Helium – Zeeman effect – Larmor's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – Lande'g factor and explanation of splitting of D1 and D2 lines of sodium.

Unit IV: Nuclear models

Review of basic properties of nuclei – Size, Mass, Density, Charge - Binding energy - Nuclear stability – Models of nuclear structure –types of models – Liquid drop model – Shell model – Magic numbers – Collective model.

Unit V: Nuclear radiation detectors and accelerators

Interaction between energetic particles and matter – Photoelectric effect, Pair production, Compton effect - Ionization chamber – Geiger Muller counter –Solid state detector-Cloud chamber – Cyclotron - Synchrocyclotron – Betatron - Bevatron.

Books for Study

1. Murughesan, R., Modern Physics, S. Chand & Co., New Delhi, 2006 (Unit I to V).

Books for References

1. Arthus Beiser, Concept of Modern Physics, Mc Graw Hill Ed., 2003 (Unit I to V).

Total Number of Topics Present in the course:50

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	50

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

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ANALOG ELECTRONICS

Core Course: VIII	Semester: V
Course Code: 18UPH5CC8	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 5	External Marks : 75

Objectives:

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

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 – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class β 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 & Characteristics of JFET - Difference between JFET and Bipolar Transistor- Working &V-I characteristics of SCR, UJT - UJT as relaxation oscillator.

Unit V: Operational amplifiers

Introduction to Operational amplifiers – 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.

Books for Study

1. V.K. Mehtha, Principle of Electronics, S.Chand Publictions, NewDelhi, 3rd Edition , 2008 (Unit I to V).

Books for References

1.B.L.Theraja, Basic Electronics solid state physics, S.Chand and company Ltd., 2002 (Unit I to V).

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,

PRACTICAL III

Core Practical – III
Course Code: 16UPH5CP3
Hours / Week: 4
Credit: 3

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

Any TEN experiments

1. Koenig's method – Uniform bending – Y.
2. Spectrometer i-i' curve.
3. Spectrometer – Small angle prism.
4. Spectrometer – Grating – Normal incidence.
5. Spectrometer – Grating minimum deviation and dispersive power.
6. Spectrometer – Cauchy's constants.
7. Spectrometer – Fraunhofer lines.
8. Spectrometer – Hartmann's Formula.
9. Field along the axis of a coil – determination of M.
10. M and H – Absolute determination using deflection and vibration magnetometer.
11. Potentiometer – EMF of a thermocouple.
12. Potentiometer x of thermistor.
13. Potentiometer - High range voltmeter calibration.
14. Ballistic Galvanometer – Figure of merit.
15. Anderson's bridge – AC self inductance of a coil.

Total Number of Topics Present in the course:15

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	15

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

MATERIAL SCIENCE

Major Based Elective: I
Course Code: 18UPH5MBE1
Hours / Week: 5
Credit: 5

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

Objectives:

- To know about the different types of material and their behavior
- To appreciate the application of superconducvity in the daily life
- To summarize the factors affecting the mechanical properties of a material

Unit I: Crystal Structure

Types of crystal - Space lattice – Basis - Unit cell and lattice parameters – Bravais lattices - Lattice planes and Miller indices - Inter planar spacing in a cubic lattice – Crystal structure: SC, BCC, FCC, Sodium Chloride and Diamond crystal structure – Bonding of solids (Ionic, Covalent , Metallic , Hydrogen and Van der Waal).

Unit II: Superconducting Materials

Superconductivity – Properties - Meissner's effect - London equations - Types of superconductors: Type I and Type II – High temperature superconductors - A Applications of superconductor - Josephson effects and its Applications – SQUIDS – Levitation – Maglev train – Cryo Applications.

Unit III: Nanomaterials

Introduction to nanomaterial -Nanoscience and nanotechnology – Nanomaterials - Properties of nanomaterials (size dependent) - Synthesis of nanomaterials – Fullerenes – Application of nanomaterials – Carbon nanotubes - Fabrication - structure of carbon nanotubes - Properties of carbon nanotubes (Mechanical and Electrical) – Applications of CNT's.

Unit IV: Smart Materials

Metallic glass and its a Applications — Fiber reinforced metals – SAW Materials and its a Applications – Biomaterials – Ceramic - Nuclear engineering materials - Nanophase materials - SMART materials - Conducting polymers- Optical materials - Fiber optic materials and their Applications.

Unit V: Mechanical Behavior of Materials

Different mechanical properties of Engineering materials – Applications -Factors affecting mechanical properties of a material – Mechanical tests -Types of mechanical tests – Deformation of metals – Bauschinger effect – Elastic after effect – Deformation of crystals polycrystalline materials.

Book for study

1. G. Senthil kumar, Engineering Physics – II, VRB Publishers Pvt. Ltd., 2015 (Unit I, II & III)
2. G. Cao, Nanostructures and Nanomaterials, World Scientific Publishing Co. Pvt.Ltd., Singapore, 2nd Edition,
2011 (Unit III).
3. M. Arumugam, Material Science, Anuradha puplishers, 1990 (Unit I, IV & V).

Book for References

1. S. O. Pillai, Solid State Physics, New Age International, New Delhi, 2006.
2. Dr. M.N. Avadhanulu, Material Science, S.Chand & Company, New Delhi, 2014.
3. V. Raghavan, Material Science and Engineering, Printice Hall, New Delhi, 2004.
4. V. Rajendran, Material Science, Tata McGraw Hill Ltd, New Delhi, 2001.

Total Number of Topics Present in the course: 53

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	09
2.	Regional	09
3.	National	09
4.	Global	53

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

COMPUTATIONAL SCIENCE

Skill based elective: II
Course Code: 18UPH5SBE2
Hours / Week: 2
Credit: 2

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

Objectives:

- To have a basic idea about the internet and its use in doing scientific research
- To prepare a presentation in power point by including pictures, chart, sound and so on
- To get a knowledge about the softwares used for interpreting the results

Unit I: Internet and Research

Introduction to Internet - Browsers – sending and receiving email – file downloading and uploading – difference between Intranet and Internet – Online journals – e-books - Scientific research – Aim and motivation - Principles and ethics – Identification of research problem – Performing Experiments - Data Collection.

Unit II: Origin Lab

Introduction - Graphing: Graph types – Column & Bar & Pie graph – Line and Symbol plot – Histogram & stacked histogram – 2D, 3D graph, Curve Fit: Linear Fit – Nonlinear curve fit, Peak Analysis: Baseline correction, Peak finding, Peak fitting.

Unit III: MS Office for data analysis

MS- Excel – Spreadsheet – workbook window – Formatting Cells / Worksheet –Working with Formula, Function and Charts – Linear fit – performing arithmetic operations - Filtering data and Plotting graphs.
MS-PowerPoint presentation - Presenting Scientific results: Creating a new slide – Formatting text and slide, working with slide show – Insert files – picture – textbox – sounds – Chart & Object – Different slide views.

Unit IV: MATLAB

Basics of MATLAB – Matrices and Vectors – Matrix and Array operation: Arithmetic, Relational, Logical, Elementary math functions – Saving and loading data: Importing data file, Plotting Simple Graph (basic theory only) – Applications: Solving a linear system, Curve Fitting: Polynomial curve fitting (Straight line fit only) – Graphics (introduction only).

Unit V: Software packages

LabVIEW: Basics and Virtual Instrumentations, Applications – Basics of SHELXL: Introduction and its Application in crystal structure refinement, ICDD (JCPDS) - Basics and its uses in X-ray diffraction analysis – Application Software and Libraries: GAUSSIAN – MATHEMATICA – GNUPLOT & LATEX (Basics only).

Books for Study

1. Rajammal Devadas, Handbook of Methodology of Research, R.M.M. Vidyalaya Press, 1976 (Unit I).
2. MS-Office and Internet by Alexis Leon (Unit I & III).
3. Origin 8 User Guide, WWW. Originlab.com, 1st Edition (Unit II).
4. Ruthra Prathap, Getting Started with MATLAB, Oxford University Press, 2002 (Unit IV).

5. LabVIEW User Manual, National Instruments, April Edition, 2003 (Unit V).
6. http://www.gaussian.com/g_tech/gv5ref/basics.htm (Unit V).

Books for References

1. V. Rajaraman and C. Siva Ram Murthy, Parallel Computers—Architecture and Programming, Prentice Hall of India.
2. William H. Press, Saul A. Teukolsky, William Vetterling, and Brian P. Flannery, Numerical Recipes: The Art of Scientific Computing, Cambridge University Press, 2007.
3. Computer Basics – V.Rajaraman – PHI

Total Number of Topics Present in the course: 49

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	07
2.	Regional	06
3.	National	07
4.	Global	47

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

ELECTRICAL APPLIANCES-II

Skill based elective: III
Course Code: 18UPH5SBE3
Hours / Week: 2
Credit: 2

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

Objectives:

- To have an idea about the safety precautions when installing
- To know about the different tools needed for installation and repair
- To study about the different kinds of circuit

Unit I: Safety Precautions

Individual safety precautions – Electrical safety precautions – Gas safety precautions – Chemical safety precautions – Appliance and air conditioner safety – Operating safety – Installation safety precautions – Grounding of appliances – Checking appliance and air conditioner voltage.

Unit II: Tools needed for installation and Repair

Safety precautions when handling tools – Screwdrivers – Nut drivers – Wrenches – Hammers – Prying tools – Pliers – Cutting tools – Power tools – Speciality tools – Test meters – Advantages of digital meters.

Unit III: Electricity

Electrical wiring – What is a circuit – Circuit components – Kinds of circuit: Series, Parallel, Series-Parallel – Types of shorts in a circuit – Strip circuits – Types of electric circuit – Theory of current flow – Ohm's law – Wiring diagram symbols – Terminal codes.

Unit IV: Electronics

Electronic controls – Low-voltage board – High voltage relay board – Three-board electronic control system – Troubleshooting circuits – Two board electronic control system – Motor board electronic control system – Resistors – Resistance color bands – Thermistor – Diodes – Tesiting a diode – Bridge rectifier – Triac – Testing a triac – Transistor – Integrated circuits and circuit boards – LED multiple segment displays.

Unit V: Electronic parts

Electronic components – Electrostatic discharge – Testing printed circuit boards – Integrated circuit chip – Resistors – Sensors – Temperature detectors – Thermistor – Thermocouple – Resistance temperature detector – Thermopile – Transducer – Inverter board – Piezoelectric ignitor.

Book for Study

1. Eric Kleinert, Troubleshooting and Repairing Major Appliances, MC Graw Hill, USA, 3rd Edition, 2013.

Book for References

1. D.C. Tayal, Principles of Electronics, Himalaya Publishing House Pvt. Ltd., 2011.

Total Number of Topics Present in the course: 64

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	64

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

ELEMENTS OF CLASSICAL & QUANTUM PHYSICS

Core Course: IX
Course Code: 18UPH6CC9
Hours / Week: 6
Credit: 6

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

Objectives:

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

Unit I: Lagrangian formalism

Mechanics for a system of particle – Constraints – Generalized co-ordinates – Transformation equations – Configuration space – Principle of virtue work – D' Alemberts principle – Lagrange's Equation – Applications of Lagrange's equation – Linear harmonic oscillator -Atwood machine, Simple pendulum.

Unit II: Hamiltonian formalism

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

Unit III: Photo electric effects

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

Unit IV: Dual nature of matter

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

Unit V: Schrodinger's wave mechanics

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

Books for Study

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

Books for References

1. H. Goldstein, Classical Mechanics, Addison Wesley, London, 2002.
2. P.M. Mathews & K.Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill, New Delhi, 37th Reprint, 2007.

3. Gupta, Kumar & Sharma, Quantum Mechanics, 23rd Edition, 2003-2004.
4. Satyaprakash, Quantum Mechanics, Pragati Prakashan.
5. L.I. Schiff, Quantum Mechanics, McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2010.

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,

DIGITAL ELECTRONICS AND MICROPROCESSOR

Core Course: X
Course Code: 18UPH6CC10
Hours / Week: 6
Credit: 6

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

Objectives

- To study various number systems, logical circuits and their implementation.
- To study the fundamentals of architecture and instruction set of an 8-bit microprocessor.
- To write Assembly Language Programs for an 8-bit microprocessor INTEL - 8085.P

Unit I: Number systems, Logic gates

Different number systems - Binary, Octal and Hexa-decimal - Conversion between the number systems - Different digital codes : Alpha numeric codes -ASCII, BCD, gray codes - Basic logic gates: AND, OR and NOT gates - Realization using diodes and transistor - Universal gates: NAND, NOR - Conversion into Basic gates, Special Gates - Ex-OR- Ex-NOR.

Unit II: Boolean algebra and K-maps

Boolean laws - Rules of Boolean laws - De-Morgan's theorems - Simplification of logical expression using Boolean algebra - Fundamental products - Minterms and Maxterms - Implementation of truth table into an equivalent logic circuit by Boolean algebra and Karnaugh maps – 4 variables.

Unit III: Combinational and arithmetic digital circuits

Basic idea of multiplexers 2:1, 4:1 - Demultiplexers 1:2, 1:4 – Decoders - Encoders - Decimal to BCD conversion - Parity generator and checker: odd & even - Arithmetic circuits: Binary addition, Binary subtraction using 2's complement method, Half adder, Half subtractor, Full adder and Full subtractor - Memories: Read-only memories (ROM), PROM, EPROM and RAM.

Unit IV: Sequential circuits

RS, D, JK and T flip-flops - Level clocked and edge triggered flip-flops - Preset and clear operations - Race-around conditions in JK flip-flops - Master-slave JK flip-flop - Counters: Asynchronous and Synchronous counters - Decade counter, Up-Down counters, Ring counter - Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out -Shift Registers (only upto 4 bits).

Unit V: Microprocessor and its Programming:

Architecture of 8085 - Block diagram, buses, registers, ALU - Interfacing devices - Timing states - Instruction cycle Interrupts and Interrupt control - Machine Language - Assembly Language - Instruction set and format – Data transfer, Arithmetic, Logical, Branching and Machine Control Operations - Microprocessor Programming: Algorithm and flowcharts - Simple programming exercises: Addition sum of two 8-bit data with & without carry, decimal addition, sum of a string of data, subtraction of two 8-bit data, 8 bit multiplication – using successive addition and 8 bit division - using successive subtraction. subtraction.

Books for Study

1. A.P. Godse & D.A. Godse, Digital Electronics - A Text Book - 2008 (Unit I to IV).
2. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, New Delhi, 2005 (Unit V).

Book for References

1. V. Vijayendran, Digital Fundamentals, S.Viswanathan Printers & Publishers Private Ltd, Chennai, 2004. (Unit I to IV)
2. Donald P. Leach & Albert Paul Malvino, Digital principles and Applications, Glencoe, 1993. (Unit I to IV)
3. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Prentice Hall, 2002. (Unit V)

Total Number of Topics Present in the course: 49

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	49

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

PRACTICAL IV

Core Practical – IV
Course Code: 18UPH6CP4
Hours / Week: 5
Credit: 4

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

Section – A – Electronics

Any SEVEN 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. Hartley oscillator using transistor.
5. Colpitt's oscillator.
6. Astable multivibrator.
7. Monostable multivibrator.
8. FET Characteristics.
9. FET amplifier.
10. Logic gates – AND, OR and NOT gates using discrete components – Truth table.
11. Universal gates NAND/NOR and basic gates from Universal gates.
12. Adder and Subtractor – Half and Full.
13. BCD to 7 segment decoder – 7 segment LED display.
14. Op – Amp – Adder and Subtractor.
15. Op – Amp – Integrator and Differentiator.
16. Demorgan's theorem and Boolean algebra.
17. Flip flop using gates.
18. Construction of power amplifier.

Section –B – Microprocessor 8085

Any THREE experiments only

19. 8-bit addition and 8-bit subtraction.
20. 8-bit multiplication and division.
21. Conversion from decimal to hexadecimal system.
22. Conversion from hexadecimal to decimal system.
23. 16 bit addition.

Total Number of Topics Present in the course:23

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	23

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

COMPUTER PROGRAMMING IN C

Major based elective: II Semester: VI

Course Code: 18UPH6MBE2 Max. Marks : 100
Hours / Week: 6 Internal Marks : 25
Credit: 3 External Marks : 75

Unit I

Introduction-History of C-Importance of C – Basic structure of C Programs – Programming Style. Constants, Variables and Data Types: Character set, Keywords and Identifiers – Constants – Variables – Data Types – Declarations of Variables – Assigning Values of variables. Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Comma Operators – Arithmetic expressions – Procedure and Associativity

Unit II

Input Output Operator: Getchar, putchar, Formatted output (printf) and Formatted input (scanf). Control Structure: Decision making with if, - if. Else – switch – Differnce between switch and nested if - go to – The break and continue statements - Differnce between break and continue statement – while – do, while – for statements. Arrays. One – dimensional and two dimensional arrays, declaring arrays, storing arrays in memory – initializing arrays.

Unit III

Functions: Basic functions – Return values and their types – calling functions- function arguments –external variables and scope rules. Structures and Union: Structures – Arrays of Structures – Arrays within structures – structures and functions – Unions.

Unit IV

Pointers: Pointers and functions – arguments – Pointers and arrays – address arithmetic – character points and functions – Pointer arrays – Point arrays – Point on Pointers. Preprocessor: Macro substitution – File inclusion – Complier control directives – opening and closing a file – reading and writing data – error handling – Random Access.

Unit V

Development of algorithm, flowchart and program for the following problem.
1. Average of a set of numbers.
2. Conversion of Fahrenheit to Celsius.
3. Solving quadratic equation.
4. Finding the factorial using recursion.
5. To add/subtract/multiply two matrices.
6. To find the smallest and largest element in an array.
7. Sorting a set of numbers in ascending/ descending order.
8. To arrange the names in alphabetical order.

Books for Study

1. Programming in ANSI – C – E. Balagurusamy – Tata McGraw Hill.
2. Schaum's Outline Series Theory and Problems of Programming with C – Byron S.Gottifried, McGraw Hill, Internationals.
3. Programming with C – Venugopal, K.R.and Sudep R.P.Tata McGraw Hill, 1998.

Total Number of Topics Present in the course:58

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	58

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

OPTO ELECTRONICS AND FIBER OPTIC COMMUNICATION

Major Based Elective: III
Course Code: 18UPH6MBE3
Hours / Week: 6
Credit: 6

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

Objectives:

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

Unit I: Interaction of light with matter

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

Unit II: Opto electronic materials and devices

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

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

Unit III: Types and applications of Laser

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

Unit IV: Fiber optic communication

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

Unit V: Optical data storage

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

Books for study

1. S. Jayakumar, Material Science, R.K Publishers, Coimbatore, 2005(Unit I to III).
2. A. Marikani, Engineering Physics, PHI Learning Private Limited, New Delhi, 2nd Edition, 2013 (Unit IV).

3. P.K. Palanisamy, Semiconductor Physics and Opto Electronics, Scitech Publications, 2003(Unit V).

Books for References

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

Total Number of Topics Present in the course: 51

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	02
4.	Global	51

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

ALLIED PHYSICS – I **18UMA1AC1/18UCH1AC1**

Objectives:

- To study the concepts of Properties of Matter, Surface tension and viscosity.
- To understand the principles of musical sound, sound waves and fiber optic communication.
- To study the concepts of thermal physics.

Unit I: Properties of Matter

Stress – strain – Hooke's Law – Elastic behavior of a material – Relation between elastic constants – Work done per unit volume in longitudinal strain – Poisson's ratio – Expression for bending moment – Experimental determination of Young's modulus by uniform bending – Non-uniform bending (Pin and microscope method).

Unit II: Sound

Simple Harmonic Motion – Composition of two simple harmonic motion – along a straight line and at right angles to each other – Lissajou's figures and their Applications – Acoustics of buildings –Reverberation – Reverberation time – Sabine's formula - Conditions for good acoustics – Law of vibration of Stretched Strings – Sonometer –AC frequency – Application.

Unit III: Surface Tension & Viscosity

Definition and dimension of surface tension – Variation of surface tension with temperature – Experiment to determine the surface tension of given liquid by Drop weight method – capillary rise method – Co-efficient of viscosity and its dimension – Poiseuille's formula – Experiment to determine the Coefficient of viscosity (Poiseuilles Method).

Unit IV: Thermal Physics

Newton's law of cooling – Verification – Specific Heat Capacity of liquid by Cooling – Bomb Calorimeter – Conduction - Coefficient of thermal conductivity – Good and bad conductor – Stefan's law of radiation – Solar Constant – Angstrom's Pyroheliometer –Temperature of the Sun.

Unit V: Optics

Electromagnetic Spectrum – Spectral response of human eye – UV and IR spectroscopy – Raman Effect – Experimental arrangement – Applications of Raman Effect.

Fiber Optic communication: Introduction – Optic Fiber – Numerical Aperature – Coherent bundle – Fiber optic communication system and its advantages – Multimode Fibre –Types of sensors - Optic Sensors.

Book for Study:

1. R. Murugesan, Er. KiruthigaSivaprasath, Properties of Matter and Acoustics, S. Chand & Co., New Delhi, 2012 (Unit I-III).
2. BrijLal and N.Subrahmanyam, Heat and Thermodynamics, S. Chand and Company Ltd., New Delhi, 2008 (Unit IV).
3. BrijLal and N.Subrahmanyam, Text Book of Optics, S. Chand and Co., Delhi, 2010 (Unit V).

References

1. A.S.Vasudeva, Modern Engineering Physics, S. Chand and CompanyLtd., 1988.
2. BrijLal and N.Subrahmanyam, Text book of Sound, Vikas Publications Pvt. Limited, 2000.
3. AjoyGhatak, Optics, Tata McGraw Hill, Delhi, 2nd Edition, 2004.
4. R.Murugeshan, Modern Physics, S.Chand and company Ltd., New Delhi, 2006.

Total Number of Topics Present in the course:55

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	03
4.	Global	55

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

Allied Physics for Maths and Chemistry

Semester: I & II **18UMA2AC2P/18UCH1AP1**

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.

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,

Allied Physics for Maths and Chemistry

Semester: IIALLIED PHYSICS – III **18UMA2AC3/18UCH2AC2**

Objectives:

- To study Gauss law and its applications
- To understand the knowledge of magnetic field in various conducting media
- To learn about atomic and nuclear physics

Unit I: Electrostatics

Gauss law – proof – force between two point charges in vacuum Applications of Gauss law – electric field due to a line charge - an infinite plane sheet of charge – infinite charged conducting plate – charged spherical shell and charged sphere – Coulomb's law from Gauss law – Applicaqtion – capacitors – parallel – Series -plate capacitor with dielectric - dielectric with varying thickness.

Unit II: Magnetism and Current Electricity

Magnetizing field – intensity of magnetization – flux density – hysteresis – energy loss in hysteresis – Ampere's law – Biot-Savarts law – magnetic field due to straight conductor carrying current – magnetic field on the axis of a circular coil carrying current – magnetic field due to a solenoid – force between two parallel conductors – Potentiometer – principle and measurement of resistance and current.

Unit III: Atomic Physics

Somerfield, Vector Atom models – quantum numbers in vector atom model – Pauli's exclusion principle – Continuous and characteristic X-Rays – Moseley's law and its importance – Bragg's law – Miller indices – Determination of crystal structure – powder crystal method -Types.

Unit IV: Nuclear Physics

Nuclear Size – charge – mass – spin – nuclear models – liquid drop model – shell model – Particle detectors – cloud chamber – bubble chamber – photographic emulsion technique – Elementary particles (fundamental ideas only).

Unit V: Electronics and Digital Electronics

Modulation – necessity of modulation – Methods of modulation – Amplitude Modulation – junction diode detector for AM signal – Number systems – Decimal, Binary, Octal, Hexadecimal and their mutual conversions –Binary addition, Subtraction, Multiplication– binary arithmetic operations – Basic logic gates – AND, OR, NOT, NOR, NAND – NOR and NAND gate as universal gates -Truth tables– Laws of Boolean Algebra – De Morgan's theorems, their verifications using truth tables.

Books for study:

1. Brijlal and N. Subrahmanyam, Text book of Electricity and Magnetism, RatanprakasanMandir Publisher London, 1997 (Unit I & II).
2. Murugesan, Modern Physics, S. Chand & Co., New Delhi, 2010 (Unit III & IV).
3. B.L. Theraja, Basic Electronics, S. Chand & Co., New Delhi, 2008 (Unit V).

References:

1. Gupta and Kumar, Hand Book of Electronics, PragatiPrakasan.
2. A. Sundaravelusamy, Allied Physics – II.

Total Number of Topics Present in the course:63

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	63

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 - Verification of Ohm's Law - SI units - 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 - Series and parallel resonant circuits - Impedance - Q factor - Selectivity and Sharpness of resonance.

Unit III: Number Systems, Codes and Logic gates

Introduction - 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 - 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 - 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: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,

Semester: III & IV **18UPH4AC4P**

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. Meter 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

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: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,

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

Unit III: Lasers

Introduction - Laser and Maser - Basic concepts of stimulated emission - Spontaneous emission - Population inversion and Meta stable state - 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.

Unit V: Operational Amplifier

Introduction - The basic operational amplifier - Inverting and non- inverting operational Amplifier - Differential operational 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:51

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	51

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

THANTHAI HANS ROEVER COLLEGE, PERAMBALUR – 621220
(AUTONOMOUS)
M.Sc. PHYSICS – COURSE STRUCTURE UNDER CBCS
(For the candidates admitted from the academic year 2018-2019 onwards)

SEM	COURSE CODE	COURSE	COURSE TITLE	HRS/ WEEK	CREDIT	EXAM HRS	CIA MARKS	UNI EXAM MARKS	TOTAL MARKS
I	18PPH1CC1	CORE-I	Mathematical Physics	6	4	3	25	75	100
	18PPH1CC2	CORE-II	Classical Mechanics and Relativity	6	4	3	25	75	100
	18PPH1CC3	CORE-III	Electronics	5	4	3	25	75	100
	18PPH1CC4	CORE-IV	Atomic and Molecular Spectroscopy	5	4	3	25	75	100
	18PPH1CP1	CORE Practical I	Physics Practical – I (General and Electronics Practical)	8	4	3	40	60	100
TOTAL				**30**	**20**				**500**
II	18PPH2CC5	CORE-V	Electromagnetic Theory	6	5	3	25	75	100
	18PPH2CC6	CORE-VI	Quantum Mechanics	6	5	3	25	75	100
	18PPH2CP2	CORE Practical II	Physics Practical – II (Microprocessor and C programming practical)	8	4	3	40	60	100
	18PPH2EC1	ELECTIVE COURSE-I	Microprocessor and Communication Electronics	5	5	3	25	75	100
	18PPH2EC2	ELECTIVE COURSE-II	Numerical methods and Programming	5	5	3	25	75	100
TOTAL				**30**	**24**				**500**
III	18PPH3CC7	CORE-VII	Statistical Mechanics	6	5	3	25	75	100
	18PPH3CC8	CORE-VIII	Solid State Physics	6	5	3	25	75	100
	18PPH3CP3	CORE Practical III	Physics Practical – III (Liquid state and Solid State Physics Practical)	8	4	3	40	60	100
	18PPH3EC3	ELECTIVE COURSE-III	Crystal growth and Thin film Physics	5	5	3	25	75	100
	18PPH3EC4	ELECTIVE COURSE-IV	Nonlinear Optics	5	5	3	25	75	100
TOTAL				**30**	**24**				**500**
IV	18PPH4CC9	CORE-IX	Nuclear & Particle Physics	5	5	3	25	75	100
	18PPH4CC10	CORE-X	Advanced Physics	5	5	3	25	75	100
	18PPH4CP4	CORE Practical IV	Physics Practical – IV (Analog & Digital Electronics Lab)	8	4	3	40	60	100
	18PPH4EC5	ELECTIVE COURSE-V	Introduction to Nanoscience and Nanotechnology	5	4	3	25	75	100
	18PPH4PW	PROJECT	Project Work – Dissertation – 80 Marks; Viva – 20 Marks	7	4	-	-	-	100
TOTAL				**30**	**22**				**500**
GRAND TOTAL				**120**	**90**				**2000**

MATHEMATICAL PHYSICS

Core Course: I
Course Code: 18PPH1CC1
Hours / Week: 6
Credit: 4

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

Objectives:

- To practice mathematical methods for Physics through vector analysis
- To know about the evaluation of definite integrals
- To derive some special functions like Legendre, Bessel, Laugerre and Hermite differential equations

Unit I: Vector analysis and Matrix theory

Concept of gradient - divergent – curl - Line integral - surface integral - volume integral – Gauss theorem - Green's theorem - Stoke's theorem - Applications – Orthogonal curvilinear coordinates – Expression for gradient, divergence, curl and Laplacian in cylindrical and spherical co-ordinates – Characteristics equation of a matrix – Eigen values and Eigen vectors – Cayley-Hamilton theorem – Reduction of a matrix to diagonal form.

Unit II: Complex analysis

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

Unit III: Special functions

Gamma and Beta functions – Series solution: Legendre – General Solution of Legendre's equation - Orthogonal Properties - Bessel - Laugerre - General function of Laguerre Polynomial - Orthogonal Properties - Hermite differential equations - General function of Hermite's Polynomial - Orthogonal Properties – Rodrigues formula – Generating functions – Orthogonality relations – Important recurrence relations.

Unit IV: Fourier series & Laplace transforms

Fourier series – Determination of Fourier coefficients - Dirichlet's theorem - Change of interval - Complex form - Fourier series in the interval $(0, \infty)$ - Uses of Fourier series - Laplace transform: Definition, Properties - Translation property - Inverse Laplace transform: properties, example problems.

Unit V: Group theory & Tensors

Group theory: Definition of Groups - Groups of transformation - Multiplication Table (C4**V**) - Subgroups and conjugate classes - Cyclic groups - Symmetry Elements - Transformation & matrix representation - Point & space groups - Reducible & irreducible representation of a group.

Tensors: Transformation of coordinates – Summation convention – Contravariant, covariant and mixed tensors – Rank of a tensor – Symmetric and antisymmetric tensors – Contraction of tensor.

Books for study

1. Sathya Prakash, Mathematical Physics, Sultan Chand & Sons, 1997.
2. Balaji, Engineering mathematics-I, G. Balaji publishers, 2008.
3. Balaji, Engineering mathematics-II, G. Balaji publishers, 2009.
4. H.K.Dass and Rama Verma, Mathematical Physics, 8th edition, 2018

Books for References

1. A.W. Joshi, Matrices and Tensors in Physics, New Age International (P) Ltd., New Delhi, 3rd Edition, 1995, Reprint 2005.
2. Erwin Kreyzig, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 2006.
3. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Engineering Mathematics, Vol I-III,First edition-Scitech Publications (India) pvt.Ltd., 2009.
4. Granino A.Korn and therasa M.Korn, Mathematical hand book for Scientists and Engineers, Dover publications ins, New York, 2013
5. B.D. Gupta, Mathematical Physics, Vikas Publishing House, Noida, 4th Edition, 2010.

6. B.S. Rajput, Mathematical Physics, Pragati Prakashan, Meerut, 17th Edition, 2004.
7. A.W. Joshi, Elements of Group Theory for Physicists, New Age International (P) Limited, New Delhi, 1997.

Total Number of Topics Present in the course:67

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

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

CLASSICAL MECHANICS

Core Course: II	Semester: I
Course Code: 18PPH1CC2	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 4	External Marks : 75

Objectives:

- To learn about the fundamentals of classical generalized coordinates and formation
- To know about both Lagrangian and Hamiltonian formalisms
- To study the general theory of small oscillations and rigid body dynamics

Unit I: Lagrangian formalism

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

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 and Canonical transformations - Generating function and different forms.

Unit III: Hamilton – Jacobi method

Hamilton-Jacobi equation for Hamilton's principal function-Hamilton Jacobi method - Solution of harmonic oscillator by Hamilton Jacobi method – Applications of Hamilton -Jacobi method: Particle falling freely - Kepler problem - Poisson's brackets: Definition and Equation of motion in Poisson's bracket form- Applications

Unit IV: Rigid body and theory of small oscillations

Rigid bodies –Independent coordinates of rigid body - 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's four-dimensional space – Lorentz transformation as rotation in Minkowski's space – Compositions of Lorentz transformation about two orthogonal directions – Thomas precession – Invariance of Maxwell's equations under Lorentz transformation – Elements of general theory of relativity.

Books for study

1. S.L. Gupta, V. Kumar & H.V. Sharma, Classical Mechanics, Pragati Prakashan, 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.

Total Number of Topics Present in the course: 44

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	04
2.	Regional	04
3.	National	04
4.	Global	44

ELECTRONICS

Core Course: III
Course Code: 18PPH1CC3
Hours / Week: 5
Credit: 4

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

Objectives:

- To understand the I-V characteristics of the semiconducting materials
- To study the idea of conversion of digital signal to analog signal and vice versa
- To know about the characteristics of Operational Amplifier

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 -Optoelectronics: Photo resistor – Photo diode – Photo transistor – Photo multiplayer – Photo conductor – LED – Photo voltaic effect – Solar cells.

Unit II: Special semiconductors

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 – Operational amplifier characteristics – frequency response – CMRR – Inverting and non-inverting amplifier – Instrumentation amplifier – Voltage follower – Integrating and differential circuits – Log & antilog amplifiers – Op-amp as comparator – a 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.

Books for Study

1. Albert Malvino, David J Bates, Electronics Principles, 7th Edition, Tata McGraw Hill Publishing Company 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.

Total Number of Topics Present in the course: 73

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	05
2.	Regional	05
3.	National	05
4.	Global	73

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

ATOMIC AND MOLECULAR SPECTROSCOPY

Semester: I

Course Code: 18PPH1CC4	Max. Marks : 100
Hours / Week: 5	Internal Marks : 25
Credit: 4	External Marks : 75

Objectives:

- To understand the elements of atomic and molecular spectroscopy
- To define the basic idea of the atomic spectra through Pauli's exclusion principle
- To explain about the experimental procedure of NMR and ESR spectrum

Unit I: Atomic Spectra

Rotation of Molecules – Rigid Rotor (Diatomic Molecules) -Quantum states of electron in atoms – Hydrogen atom spectrum – Electron spin – Bohar Magnetron -Stern-Gerlach experiment – Spin-orbit interaction – Two electron systems – LS-JJ coupling schemes – Hyperfine structure - Exchange symmetry of wave functions – Various Quantum Numbers-Pauli's exclusion principle – Alkali type spectra – Equivalent electrons – Hund's rule.

Unit II: Atoms in external magnetic and electric fields

Introduction-Theory of Zeeman effect -Experimental study of Zeeman effect – Classical interpretation – Normal Zeeman effect – Anomalous Zeeman effect - Paschen-Back effect – Quantum mechanical treatment of Zeeman and Paschen Back effect – Stark effect.

Unit III: Microwave and IR Spectroscopy

Rotational spectra of diatomic molecules – Effect of isotopic substitution – The non-rigid rotor - Rotational spectra of polyatomic molecules – Linear, symmetric top and asymmetric top molecules – Experimental techniques - Vibrating diatomic molecule – Diatomic vibrating rotator – Linear and symmetric top molecules – Analysis by infrared techniques.

Unit IV: Raman Spectroscopy and Electronic Spectroscopy of Molecules

Raman spectroscopy: Raman Effect - Quantum theory of Raman effect – Rotational and vibrational Raman shifts of diatomic molecules – Selection rules – Experimental techniques – Stimulated Raman scattering.

Electronic spectroscopy of molecules: Electronic spectra of diatomic molecules - The Franck Condon principle – Dissociation energy and dissociation products – Rotational fine structure of electronic vibration transitions – Experimental techniques

Unit V: Resonance Spectroscopy

NMR: Basic principles – Classical and quantum mechanical description – Bloch equations – Spin-spin and spin-lattice relaxation times – Chemical shift and coupling constant - Experimental methods – Application of NMR.

ESR: Basic principles – ESR spectrometer – Nuclear interaction and hyperfine structure – Relaxation effects – g-factor – Experimental methods and Applications ESR.

Books for study

1. C. N. Banwell, Fundamentals of Molecular Spectroscopy, McGraw Hill, New York, Fourth Edition, 2008.
2. R. Murugesan, Modern Physics, 17th edition, S. Chand Pvt Ltd, New Delhi, 2013.
3. G. Aruldhas, Molecular Structure and Spectroscopy, Prentice-Hall of India Pvt. Limited, 2004

Books for References

1. Arther Beiser, Concept of Modern Physics, 6th Edition, Tata Mc Graw Hill Pvt ltd, New Delhi 2003.

2. S.L. Gupta, V. Kumar, R.C. Sharma, Elements of Spectroscopy, Pragati Prakashan, Meerut, 1996.

Total Number of Topics Present in the course: 60

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	04
4.	Global	58

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

PHYSICS PRACTICAL - I
GENERAL & ELECTRONICS PRACTICAL

Core Practical - I	Semester: I
Course Code: 18PPH1CP1	Max. Marks : 100
Hours / Week: 8	Internal Marks : 40
Credit: 4	External Marks : 60

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

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 monostable multivibrator
15. Design and study of bistable multivibrator
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,

ELECTROMAGNETIC THEORY

Core Course: V | Semester: II
Course Code: 18PPH2CC5 | Max. Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To know about the derivation of Poisson's and Laplace equation
- To understand the relation connecting the different parameters in electrostatics and magnetostatics
- To derive the Maxwell equations in terms of the vector and scalar potentials

Unit I: Electrostatics

Electric field: Coulomb's law – Gauss law - electric field due to a point charge- field due to an infinite line charge - field due to an infinite sheet of charge – Continuous charge distribution - Electrostatic potential – Poisson's and Laplace equations – Multipole expansion of a charge distribution – Dirichelt and Neumann boundary conditions: Methods of separation of variable – Potentials within a conducting box – Methods of images – Point charges in the presence of a grounded conducting sphere.

Unit II: Electrostatics in macroscopic media

Potential and field due to an electric dipole - Dielectric polarization - External field of a dielectric medium - Gauss theorem - Electric displacement vector **D** - Linear dielectrics - Relations connecting electric susceptibility χ_e, Polarization **P**- Displacement **D** - Dielectric constant - Boundary conditions of field vectors - Molecular field - Clausius Mosotti relation for non-polar molecules - Electrostatic energy and energy density.

Unit III: Magnetostatics

Lorentz force law – Biot and Savart law – Magnetic field due to straight conductor – Ampere's law in differential form – Magnetic vector potential – Multipole expansion of a vector potential – Boundary conditions on B and H – Magnetic flux – Intensity of magnetization – Magnetic susceptibility - Magnetic susceptibility and permeability in linear and non-linear media.

Unit IV: Electromagnetics

Faraday's law of induction – Maxwell's displacement current – Maxwell equations – Maxwell equations in terms of vector and scalar potentials – Lorentz invariance of Maxwell's equation - Gauge transformations: Lorentz gauge- Lorentz force law in potential form- Coulomb gauge – Poynting's theorem – Conservation of energy and momentum for a system of charged particles and electromagnetic fields - Transmission lines - waveguides – TE waves in rectangular wave guides - Dynamics of charged particles in static and uniform electromagnetic fields.

Unit V: Relativistic Electrodynamics

Four vectors - Transformation relation for charge and current densities for electromagnetic potentials - Covariant form of inhomogeneous wave equations - Covariance of field equations in terms of four vectors - Covariant form of electric and magnetic field equations - Covariance of electromagnetic field tensor - Covariant form of Lorentz force law.

Books for Study

1. K.K. Chopra & G.C. Agarwal, Electromagnetic Theory, Nath & Co., 1984.
2. Gupta, Kumar & Singh, Electrodynamics, Pragati Prakashan, Meerut,1992
3. Satyaprakash, Electromagnetic Theory & Electrodynamics, Kedar Nath Ram Nath & Co., Meerut.
4. J.D. Jackson, Classical Electrodynamics, Wiley India Edition, 3rd Edition, Reprint 2009.

References

1. M. Schwartz, Principles of Electrodynamics, Dover Publications, New York,1987.
2. Dale R. Carson & Paul Lorrain, Introduction to EM Fields & Waves, Free man, 1st Edition, 1962.
3. David J. Griffiths, Introduction to Electrodynamics, Pearson International Edition, 4th Edition, 2013.

Total Number of Topics Present in the course:58

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	0
4.	Global	58

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

QUANTUM MECHANICS

Core Course: VI
Course Code: 18PPH2CC6
Hours / Week: 6
Credit: 5

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

Unit I: Schrodinger equation and general formulation

Physical meaning and conditions on the wave function - Schrodinger equation – Expectation values and Ehrenfest's theorem – Hermitian operators and their properties – 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.

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.

Unit IV: Angular Momentum

Orbital angular momentum - Spin angular momentum - Total angular momentum operators - Commutation relations of total angular momentum with components - Ladder operators - Commutation relation of J_z with J_+ and J_- - Eigen values of J^2, J_z - Matrix representation of J^2, J_z, J_+ and J_- - Addition of angular momenta - Clebsch Gordon coefficients –(J_1=1/2,J_2=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, 2005L.
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, Pragati Prakashan.
3. Merzbacher E, Quantum Mechanics, Wiley and Sons, USA, 3rd Edition, 1998.

Total Number of Topics Present in the course:39

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	39

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

PHYSICS PRACTICAL - II

MICROPROCESSOR AND C PROGRAMMING

Core Practical - II | Semester: II
Course Code: 18PPH2CP2 | Max. Marks : 100
Hours / Week: 8 | Internal Marks : 40
Credit: 4 | External Marks : 60

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

A. Microprocessor Practicals

1. 8 bit addition, subtraction, multiplication and division using 8085.
2. 16 bit addition, 2's complement and 1's complement subtraction.
3. Conversion from decimal to octal and hexa systems.
4. Conversion from octal, hexa to decimal systems.
5. Study of ADC interfacing (ADC 0809).
6. Study of DAC interfacing (DAC 0900).
7. Traffic control system using microprocessor interfacing.
8. Control of stepper motor using microprocessor interfacing.
9. Arithmetic programs using microcontroller.
10. Key Interface using microcontroller.

B. Computer Practicals (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,

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MICROPROCESSOR AND COMMUNICATION ELECTRONICS

Elective Course: I
Course Code: 18PPH2EC1
Hours / Week: 5
Credit: 5

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

Objectives:

- To understand the hardware components and software programming instructions of INTEL 8085 microprocessor and 8051 microcontrollers
- To understand the concept of interfacing and peripheral devices
- To study the various functions and applications of optical fibre

Unit I: Microprocessor Intel 8085

Pin diagram - Architecture - Organization of Control, data and address buses – Addressing modes - Instruction sets - Timing diagram for opcode fetch, memory read and write cycles – Interrupts - Assembly language programming - Multibyte addition, Multibyte subtraction – Ascending and descending orders – Square and square root of a single byte – Delay routine using single register -Procedures - Assembler Macros - Assembler directives.

Unit II: Interfacing Memory and I/O Devices

Memory mapped I/O – I/O mapped I/O - Data transfer schemes-Synchronous data transfer – Multiple interrupts- Programmed and DMA data transfer schemes - Programmable peripheral interface (8255A) - 8253 timer interface - DMA controller - Programmable interrupt controller (8259) – Programmable communication interface (8251).

Unit III: Microcontroller Intel 8051

Comparison of Microprocessors and Microcontrollers – Architecture – Memory organization - Pin diagram – Addressing modes – Instruction set – Interrupts – timer-counters- Boolean processor - Assembly language programming – 8-bit addition, subtraction, multiplication and division – Sum of the the elements in an array – Ascending and descending order.

Unit IV: Communication Electronics

Analog and Digital signals – Modulation – Types of Modulation - Amplitude modulation theory – Frequency spectrum of the AM wave – Representation of AM – Power relations in the AM wave – Generation of AM – Basic requirements - Description of frequency and phase modulation – Mathematical representation of FM – Frequency spectrum of the FM wave - Effects of noise on carrier.

Unit V: Optical Fibres

Propagation of Light in an Optical Fibre –Acceptance Angle - Numerical aperture: Step and Graded index fibre – single mode - multimode fiber-Optical fibre as a cylindrical wave guide - Wave guide equations - Wave equations in step index fibres - Fibre losses and dispersion - Applications.

Books for Study

1. B.Ram, Fundamentals of Microprocessors and Microcomputers, Dhanapet Rai & Sons, New Delhi, 5th Edition, 2001.
2. P.S. Manoharan, Microprocessors & Microcontrollers, Charulatha Publications, 2013.
3. George Kennedy & Davis, Electronic Communication System, Tata McGraw Hill, 4th Edition, 1999.

References

1. Taub Schilling, Principles of Communication Systems, TMH 1986.
2. Carlson, Communication Systems, McGraw Hill, 3rd Edition 1986.
3. Stewart D. Personick, Fibre Optics technology & Applications, Khanna Publishers, Delhi.

Total Number of Topics Present in the course:62

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

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

NUMERICAL METHODS AND PROGRAMMING

Elective Course: II | Semester: II
Course Code: 18PPH2EC2 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To familiarize the students with numerical methods and computer programming using C language
- To study Numerical Integration using different rules
- To determine the roots of non-linear equations using Newton-Raphson's method

Unit I: Introduction to numerical computing

Process and characteristics of numerical computing - Computational environment - Integer and floating point - Representation of numbers - Computer arithmetic - 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: Numerical integration

Newton cotes formula - Trapezoidal rule - Simpsons rule - Simpsons 1/3 rule - Simpsons 3/8 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

N^{th} order ordinary differential equations – Power series approximation – Point wise method – Solutions of Taylor series – Euler's method – Improved Euler's method – Runge-Kutta method: First order - second and fourth order – Runge-Kutta method for solving first order differential equations – 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 - synthetic division - Newton-Raphson method for finding the roots of a single nonlinear equation.

Books for Study

1. T.Veerarajan, T.Ramachandran, Numerical Methods With Programs in C, Tata Mc Graw Hill Publishing Company,New Delhi,2008.
2. E. Balagurusamy, Numerical Methods, Tata Mc Graw 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.

Total Number of Topics Present in the course:48

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	48

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

STATISTICAL MECHANICS

Core Course: VII
Course Code: 18PPH3CC7
Hours / Week: 6
Credit: 5

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

Objectives:

- To review the fundamental concepts of thermodynamics in order to understand Statistical mechanics
- To understand the fundamental principles of Statistical mechanics
- To apply the quantum mechanical ideas to Statistical mechanics

Unit I: Thermodynamics and radiation

Basic postulates of thermodynamics – Laws of thermodynamics - Concept of work, internal energy and heat – Entropy – second law of thermodynamics – Principle of increase of entropy - Thermodynamic Potential and Reciprocity relation – Enthalpy – Helmholtz – Gibb's functions – Clausius Clapeyron's equation.

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 law – 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 - Critical exponent – Yang and Lee theory - Phase transitions of second kind: The Ising model - Bragg Williams approximation- one dimensional Ising model

Books for study

1. Gupta & Kumar, Statistical Mechanics, Pragati Prakashan, Meerut, 24th edition, 2011.
2. Satya Prakash, J.P. Agarwal, Statistical Mechanics, Kedar Nath 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.
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.

Total Number of Topics Present in the course: 46

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

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

SOLID STATE PHYSICS

Core Course: VIII
Course Code: 18PPH3CC8
Hours / Week: 6
Credit: 5

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

Objectives:

- To know how to interpret the results obtained from the X-ray diffraction
- To understand the energy bands in metals, semiconductors and insulators
- To know the recent developments in high temperature superconductivity

Unit I: **States of matter**

Crystalline and amorphous - Unit 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 – Clausius mosotti equation - Ferroelectric crystals and their types – Polarization catastrophe – Landau theory of phase transition: First and second order – Antiferro, pyro and piezoelectric crystals- Frequency and temperature effects on Polarization – Dielectric breakdown and dielectric loss.

Unit IV: Magnetism

Terms and definitions used in magnetism -Langevin theory of para magnetism - Quantum theory of para magnetism - Curie law – Ferromagnetism - Weiss molecular field theory - Domain theory - Anti ferromagnetism - Neel theory – Ferrimagnetism - Ferrites-spin waves - Experimental techniques to study magnetic properties.

Unit V: Superconductivity

Occurrence of Superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – Coherence length – BCS theory – Flux quantization – Type I and Type II Superconductors – Josephson superconductor tunneling – DC and AC Josephson effect – SQUID – Recent developments in high temperature superconductivity – Application of superconductors.

Books for Study:

1. C. Kittel, Introduction to Solid State Physics, Wiley India Edition, New Delhi, 7th Edition, Reprint 2008.
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, Pragati Prakashan, 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.

Total Number of Topics Present in the course: 63

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	63

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

PHYSICS PRACTICAL - III
LIQUID STATE AND SOLID STATE PHYSICS PRACTICAL

Core Practical - III
Course Code: 18PPH3CP3
Hours / Week: 8
Credit: 4

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

Any **TWELVE** only

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,

CRYSTAL GROWTH AND THIN FILM PHYSICS

Elective Course: III | Semester: III
Course Code: 18PPH3EC3 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To understand the nucleation parameters
- To know about the different techniques of crystal growth and thin films
- To know the characterization techniques relating to the structural, molecular and optical phenomenon

Unit I: Nucleation

Introduction - Kinds of nucleation - Equilibrium stability and meta stable state - 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: Classes of crystal system – Low temperature solution growth: solution, solubility and super solubility – Expression of super saturation – Mier's T-C diagram - Constant temperature bath and crystallizer – Seed preparation and mounting - Slow cooling and solvent evaporation methods.

Gel Growth Technique: Principle – Various types – Structure of gel – Importance of gel – Experimental procedure: Chemical reaction method – Single and double diffusion method – Chemical reduction method – Complex and decomplexion method – Advantages of gel method – Disadvantages of gel method.

Unit III: Melt and vapour growth techniques

Melt technique: Bridgman technique - Basic process – Various crucibles design - Thermal consideration – Vertical Bridgman technique - Czochralski technique: Experimental arrangement – Growth process.

Vapour technique: Vacuum technology - Physical vapour deposition – Chemical vapour deposition (CVD) – Chemical vapour transport.

Unit IV: Preparative techniques of thin film

Physical methods: Vacuum evaporation- Sputtering - Chemical methods: Spray pyrolysis – Electrochemical method - Types of electrodes: Counter, Working, Reference electrode - Electro and electroless coating – Sol-gel method: Dip coating - Spin coating.

Unit V: Characterization techniques

Structural: XRD: Single and Powder – Molecular: FTIR Spectroscopy – Functional group analysis – Optical: UV-Vis-NIR spectroscopy – optical constants: Transmittance – reflection – absorptions – film thickness measurements – Electrical: Four probe technique – Dielectric: dielectric constant and dielectric loss.

Books for Study

1. Brice J. C., Crystal Growth Process, John Wiley and Sons, New York, 1986.
2. P. Santhana Raghavan and P. Ramasamy, Crystal Growth, KRU Publications, 1st Edition.
3. A. Goswami, Thin Film Fundamentals, New Age International Publishers, 2008

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, Mc Graw Hill Book Company, 1969.

5. Smith Donald. L, Thin Film Deposition, Mc Graw Hill, London, 1995.

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,

NONLINEAR OPTICS

Elective Course: IV
Course Code: 18PPH3EC4
Hours / Week: 5
Credit: 5

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

Objectives:

- To know about the properties of laser to understand the non-linear optics
- To understand the pulse propagation in fibers
- To prepare students for research in optics-related topics

Unit I: 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: Third-order nonlinear optical effects

Four wave mixing and optical phase conjugation – Intensity dependent refractive index: Optical Kerr effect, self-focusing/defocusing- self phase modulation - Nonlinear Optical Absorption: Two-photon absorption, saturable absorption and reverse saturable absorption - Electro-optic, photorefractive effects – Optical limiters.

Unit IV: Ultras fast lasers and ultrafast NLO process

Pulsed optics: short pulse propagation in linear and nonlinear media, chirped pulse, group-velocity-dispersion, optical elements - Femtosecond laser pulse generation and mode-locking method - Pulse amplification, compression, and measurement - Experimental techniques: pump probe, ultrafast optical Kerr gate, fluorescence up-conversion and streak camera.

Unit V: Nonlinear fiber optics

Pulse propagation in fibers – Pulse propagation in a linear and non-linear medium – Optical Solitons – Solitons in optical fibers – Long distance Soliton transmission system – Polarization effects – Nonlinear fiber materials.

Books for Study:

1. B.B. Laud, Lasers and Nonlinear optics, 2nd Edition, New Age International (P) Ltd., 2004.
2. R. L. Sutherland, Handbook for Nonlinear Optics, Second Edition, Marcel Dekker Inc., 2003.

References

1. Robert W. Boyd, Nonlinear Optics, Academic Press, INC., 1992.
2. Geoffrey New, Introduction to Nonlinear Optics, Cambridge University Press, 2011.
3. Govind P. Agarwal, Nonlinear Fiber Optics, Fifth edition, Academic Press, 2013.

Total Number of Topics Present in the course:45

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	2
4.	Global	43

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

NUCLEAR AND PARTICLE PHYSICS

Core Course: IX
Course Code: 18PPH4CC9
Hours / Week: 5
Credit: 5

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

Objectives:

- To understand the basic structure and properties of the nucleus
- To study about nuclear radioactivity and reactions
- To study about the properties of elementary particles

Unit I: Basic Nuclear Properties

Nuclear size, shape, mass – Charge distribution – Spin and parity – Binding energy – Semi empirical mass formula – Nuclear stability – Mass parabola - 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 – Solid state detectors – Scintillation and semiconductor detectors.

Unit III: Nuclear Reactions and Nuclear models

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 – Fission cross section – Energy in fission – Bohr-Wheeler's theory of nuclear fission – Fission reactors – Thermal reactors – Homogeneous reactors – Heterogeneous reactors – Basic fusion processes - Characteristics of fusion – Solar fusion – Controlled fusion reactors.

Unit V: Particle Physics

Production of new particles in high energy reaction - Classification of elementary particles - Fundamental interaction - Quantum numbers – Anti particles - Resonances - Law in production and decay process – Symmetry and conservation laws - Special symmetric groups – Gell-Mann Nishijima theory - Quark model - SU3 symmetry - Unification of fundamental interactions - CPT invariance and Applications of symmetry arguments to particle reaction - Parity non conservation in weak interaction - Relativistic kinematics.

Books for study

1. D.C. Tayal, **Nuclear Physics**, Himalaya Publishing House, Mumbai, 2004.
2. M.L. Pandya and R.P.S. Yadav, Elements of Nuclear Physics, Kedar Nath Ram Nath, 2004.

References

1. K. S. Krane, Introductory Nuclear Physics, John-Wiley, New York, 1987.
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.

Total Number of Topics Present in the course: 75

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	75

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

ADVANCED PHYSICS

Core Course: X
Course Code: 18PPH4CC10
Hours / Week: 5
Credit: 5

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

Objective:

- To learn the basics and the advanced applications of physics in the fields of astrophysics
- To know about the Indian remote sensing programme
- To understand the data communication through wireless technology

Unit I: Astrophysics and Radio Astronomy

Astrophysics: Physical properties of stars - Life cycle of a star - End products of stellar evolution – Structure of Milky way - Expanding universe – Gravitational waves – LIGO - Future prospects.

Radio Astronomy (RA): Radio telescopes - Synchrotron radiation - Spectral lines in RA - Major discoveries in RA -RA in India - Hot big bang cosmology.

Unit II: Gravitation & Relativity

Theories of Gravitation - Conflict between Newtonian gravitation and special relativity - General theory of relativity - Mach's principle - The action principle - Einstein equations of gravitation-a heuristic derivation - Newtonian approximation - The experimental tests of the general theory of relativity - The gravitational red shift - Planetary motion - Strong Gravitational Fields - Equilibrium of massive spherical objects - Binding energy - Gravitational collapse of a homogeneous dust ball - Black holes - Detection of Black holes.

Unit III: India's Space Programme

Overview - Methodological issues in cost beneficial analysis of space programme - The INSAT system - Broadcasting - Telecommunication - Meteorology - Indian remote sensing programme – Geoinformatics (basic idea only) - The launching programme.

Unit IV: Biomedical Instruments

Ear and hearing aids: Basic measurements of ear function - Air and bone conduction - Masking - Middle ear impedance audiometry - Oto-acoustic emission - Types of hearing aids and Cochlear implants - Sensory substitution aids - Electrophysiology: Source of biological potentials - Signal size and electrodes - Functions - Features of ECG, EEG and EMG - Cardiac and blood related devices: Pacemakers - Electromagnetic compatibility – Defibrillators - Artificial heart valves - Cardiopulmonary bypass - Haemodialysis.

Unit V: Wireless Communication Technology

Cellular Radio: IMTS, AMPS control system - Security and privacy - Cellular telephone specifications and operations - Cell site equipments - Fax and data communication using cellular phones and CDPD - Digital cellular systems- Personal Communication Systems (PCS)- Differences between CS and PCS, IS-1 36 TDMA PCS, GSM, IS-95 CDMA PCS - Comparison of modulation schemes - Data communication with PCS.

Books for Study

1. A.W. Joshi, Horizons of Physics, Wiley Eastern Ltd, New Delhi, 2000.
2. R.D. Begamure (Ed.), Scientific Truths About Our Universe: Know Your Universe: Part I & II, Pune, 2002.
3. Lectures on Gravitation and cosmology, J.V.Narlikar, Macmillan co.1978.
4. An Introduction to General relativity, S.K.Bose, Wiley Eastern, 1980.
5. U. Shankar, The Economics of India's Space Programme, An Exploratory Analysis, Oxford University Press, Delhi, 2nd reprint, 2007.
6. Mohan Sundar Rajan, Space Today, National Book Trust, India, New Delhi, 5th revised reprint, 2012.
7. B.H. Brown, Medical Physics and Biomedical Engineering, Overseas Press, New Delhi, 2005.

8. R. Blake, Wireless Communication Technology, DELMAR, New Delhi, 2001.

Total Number of Topics Present in the course: 72

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	0
2.	Regional	0
3.	National	10
4.	Global	62

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

PHYSICS PRACTICAL - IV
ANALOG AND DIGITAL ELECTRONICS LAB

Core Practical - IV
Course Code: 18PPH4CP4
Hours / Week: 8
Credit: 4

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

Any TWELVE only

1. Logic gates – Universality of NAND / NOR gates Using IC's
2. Verification of Demorgan's theorems and Boolean Expressions
3. Astable and monostable multivibrator 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,

INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Elective Course: V
Course Code: 18PPH4EC5
Hours / Week: 5
Credit: 4

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

Objectives:

- To understand the classification of nanomaterials based on their dimension
- To know the background of nanomaterials and their various synthesis process
- To have an idea about the characterization techniques of nanomaterials and its applications

Unit I: Background and types of nanomaterials

Historical perspective of nanomaterials - Scientific revolution – Emergence of Nanotechnology - Challenges in Nanotechnology - Types of nanomaterials: One Dimensional (1D), Two Dimensional (2D), Three Dimensional (3D) nanostructured materials - Quantum dots – Quantum wells- Quantum wire- Exciton confinement in quantum dots.

Unit II: Synthesis of nanomaterials

Ball milling – Sol-gel and precipitation - RF plasma – Pulsed laser method - Thermolysis – Combustion synthesis – Hydrothermal / Solvothermal – Microemulsion - Gas phase condensation.

Unit III: Characterization of nanomaterials

Working principle, Instrumentation and Application of: X-ray diffraction: Debye-Scherer formula, Electron microscopes: Scanning Electron Microscope (SEM), FESEM, Transmission Electron Microscope (TEM), HRTEM - Atomic Force Microscope (AFM) - Scanning Tunneling Microscope (STM) - Photo luminescence

Unit IV: Nanomaterials and their properties

Carbon Nanotubes (CNT) – Carbon Nanowires -Metals (Au, Ag) - Metal oxides (TiO_2, CeO_2, ZnO) - Semiconductors (Si, Ge, CdS, ZnSe) -Ceramics and Composites - Dilute magnetic semiconductor - Biological system - DNA and RNA - Lipids - Size dependent properties - Mechanical, Physical and Chemical properties of nanomaterials.

Unit V: Applications

Solar energy conversion and catalysis - Nano electronics: MEMS, NEMS - Polymers with a special architecture - Liquid crystalline systems: A Applications in displays and other devices - Advanced organic materials for data storage, Photonics, Plasmonics, Chemical and biosensors - Medical Applications: Drug delivery, Cancer– Nanomaterials for water purification: Elimination of pollutants.

Books for study:

1. M. A. Shah, Tokeer Ahmad, Principles of Nanoscience and Nanotechnology, Narosa Publishing House, New Delhi, 2010.
2. G. Cao, Nanostructures and Nanomaterials, Imperial College Press, UK, 2004.
3. Phani Kumar, Principles of Nanotechnology, Scitech Publication, India Pvt. Ltd., India, 2012.

References

1. A.G. Brecket, A Hand book on Nanotechnology, Dominant Publishers and Distributors, New Delhi, 1st Edition, 2008.
2. P.K. Sharma, Origin and Development of Nanotechnology, Vista International Publishing House,

New Delhi, 1st Edition, 2008.
3. K.P. Mathur, Nano Science and Nano Technology, Rajat Publications, New Delhi, 1st Edition, 2007.
4. Hari Singh Nalwa, Nanostructured Materials and Nanotechnology, Academic Press, 2002.

Total Number of Topics Present in the course:57

S.No	Category (Local/Regional/National, Global)	No. of Topics covered
1.	Local	03
2.	Regional	03
3.	National	04
4.	Global	56

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

RESEARCH METHODOLOGY

Course: I
Course Code: 18MPPH1CC1
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

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.

Unit II: 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.

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 – SEM, FESEM, EDAX, TEM, HR-TEM with SAED, XPS, AFM – Instrumentation – Sample preparation – Analysis of materials – Study of dislocation – Ion implantation uses.

References

1. J. Anderson, B.H. Durston and M. Poole, Thesis and Assignment writing, Wiley Eastern, New Delhi, 2nd Edition, 1994.
2. Rajammal Devadas, Hand Book of Methodology of Research, R.M.M. Vidyalaya Press, 1993.
3. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2nd Edition, 2008.
5. P. K. Chattopadhyay, Mathematical Physics, Tata McGraw Hill, New Delhi, 2007.
6. Yogandra Prasad Joshi, An Introduction to FORTRAN 90/95 syntax and Programming, Allied Publishers Private Limted, New Delhi, 2003.
7. V. Rajaraman and C. Siva Ram Murthy, Parallel computers – Architecture and Programming, Prentice Hall of India, New Delhi, 2006.
8. H. K. Dass, Mathematical Physics, S. Chand & Company, New Delhi, 7th Revised Edition, 2014.
9. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2013.
10. D. Mularidharao, A.V.N. Samy, D. Dharaneeswara Reddy, Instrumental Methods of Analysis, CBS Publishers, New Delhi, 2013.

Total Number of Topics Present in the course: 77

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	01
2.	Regional	01
3.	National	01
4.	Global	77

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

ADVANCED PHYSICS

Course: II
Course Code: 18MPPH1C2
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

Nucleation – Spherical and cylindrical nucleation – Solution growth methods: Slow cooling, slow evaporation and temperature gradient methods - Melt growth: Bridgman method and its applications - Czochralski method – Thin film preparation: Physical methods: Thermal evaporation, Electron beam evaporation, Sputtering method - Chemical methods: Chemical bath deposition, Spray pyrolysis.

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 – Sono chemical – Applications of nanomaterials.

Unit IV: Nonlinear Dynamics

Regular and Chaotic motions – Linear and nonlinear oscillators and its Applications – 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 soliton solution by Hirota's direct method.

Unit V: Energy Sources

Nuclear reactor principle – Nuclear fuel source – 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.

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: 63

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	04
2.	Regional	04
3.	National	04
4.	Global	63

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

TEACHING AND LEARNING SKILLS

Course: IV
Course Code: 18MP1C4
Credit: 4

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

Objectives:

- ✓ To know the different parts of computer system and their functions
- ✓ To understand the operations and use of computers and common Accessories
- ✓ To develop different teaching skills for putting the content across to targeted audience

Unit I: Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT Applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II: Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written- Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III: Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels- Communication through web: Audio and Video Applications on the Internet- interpersonal communication through the web.

Unit IV: Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V: Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References:

1. Bela Rani Sharma, Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi, 2007.
2. Don Skinner, Teacher Training, Edinburgh University Press Ltd., Edinburgh, 2005.
3. Jonathan Anderson and Tom Van Weart, Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, UNESCO, 2002.
4. Kumar K.I, Educational Technology, New Age International Publishers, New Delhi, 2008.
5. Mangal, S.K., Essential of Teaching – Learning and Information Technology, Tandon Publications,

Ludhiana, 2002.
6. Michael D. and William, Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York, 2000.
7. Pandey S.K., Teaching Communication, Commonwealth Publishers, New Delhi, 2005.
8. Ram Babu A. and Dandapani S, Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad, 2006.
9. Singh V.K. and Sudarshan K.N., Computer Education, Discovery Publishing Company, New York, 1996.
10. Sharma R. A., Fundamentals of Educational Technology, Surya Publications, Meerut, 2006.
11. Vanaja. M. and Rajasekar S., Computer Education, Neelkamal Publications, Hyderabad, 2006.

Total Number of Topics Present in the course: 45

S. No	Category (Local/Regional/National- Global)	No. of Topics covered
1.	Local	02
2.	Regional	02
3.	National	04
4.	Global	43

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

Guide Name: Dr.S. Manimaran **Paper code: 18MPPH1CC4:1**

CRYSTAL GROWTH AND CHARACTERIZATION TECHNIQUES

UNIT – I: Nucleation

Theories of n nucleation – classical theory of nucleation - - Gibbs Thomson equation for vapour – Modified Thomson equation for melt – Gibbs –Thomson equation for solution – Energy of formation of a nucleus – Spherical nucleus – Cylindrical nucleus – Heterogeneous nucleation - Cap shaped nucleus properties – Disc shaped nucleus – Significance of single crystals – Reasons for growing single crystals – Criteria for optimizing growth parameters

UNIT – II: Crystal growth techniques

Crystal growth from melt: Czocharlski technique – Bridgmann – stockbarger technique – zone melting technique – Verneuil technique – Crystal growth from solution – Low temperature solution growth – Slow cooling technique – Slow evaporation technique – High temperature solution growth (Flux growth) – Hydrothermal growth – Gel growth – Applications

UNIT – III Structural analysis:

Interaction of X ray with matter – X – ray diffraction methods – Laue method – Bragg's method – Rotating crystal method – Powder method – Single crystal XRD analysis: Instrumentation – Crystal data – Structure determination.

UNIT – IV: Optical analysis:

FT-IR analysis: Theory of IR spectroscopy – Instrumentation- Methods of vibrations of atoms in polyatomic molecules - frequency assignments- UV-vis – NIR Analysis – Theory of UV spectroscopy – Instrumentation – Optical absorption – Optical transmittance.

UNIT – V: Mechanical, electrical and thermal analysis:

Methods of Hardness test – Vicker's test – Correlation of micro hardness with other properties – Dielectric constant – dielectric loss – conductivity and photoconductivity, thermo gravimetric analysis (TGA) – Differential Thermal analysis DTA) - Differential scanning calorimetry (DSC)

Books for reference:

1,. Crystal growth processes and methods – Dr. P. Santhana Raghavan and Dr. Pl Ramasamy (2000), KRU publications, Kumbakonam.
2. The gowth of crystals from liquid – J.C. Brice, North Holland Publishing Company, Amsterdom, 1986.
3. Fundamentals of Crystallography – C. Giacovazzo (2002), Oxford Science Publications
4. Instrumental methods of analysis H.H. Willard, L.L. Merrit, J.A. Dean and F.A Settle – (2005), CBS publishers, Newdelhi.
5. Material Science and Engineering – V. Raghavan (Third Edition 1993) – Prentice Hall of India .

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

Guide Name: Dr.R.Anbarasu **Paper code: 18MPPH1CC4:2**

CRYSTAL GROWTH AND CHARACTERIZATION TECHNIQUES

UNIT – I: Nucleation

Theories of n nucleation – classical theory of nucleation - - Gibbs Thomson equation for vapour – Modified Thomson equation for melt – Gibbs –Thomson equation for solution – Energy of formation of a nucleus – Spherical nucleus – Cylindrical nucleus – Heterogeneous nucleation - Cap shaped nucleus properties – Disc shaped nucleus – Significance of single crystals – Reasons for growing single crystals – Criteria for optimizing growth parameters

UNIT – II: Crystal growth techniques

Crystal growth from melt: Czocharlski technique – Bridgmann – stockbarger technique – zone melting technique – Verneuil technique – Crystal growth from solution – Low temperature solution growth – Slow cooling technique – Slow evaporation technique – High temperature solution growth (Flux growth) – Hydrothermal growth – Gel growth – Applications

UNIT – III Structural analysis:

Interaction of X ray with matter – X – ray diffraction methods – Laue method – Bragg's method – Rotating crystal method – Powder method – Single crystal XRD analysis: Instrumentation – Crystal data – Structure determination.

UNIT – IV: Optical analysis:

FT-IR analysis: Theory of IR spectroscopy – Instrumentation- Methods of vibrations of atoms in polyatomic molecules - frequency assignments- UV-vis – NIR Analysis – Theory of UV spectroscopy – Instrumentation – Optical absorption – Optical transmittance.

UNIT – V: Mechanical, electrical and thermal analysis:

Methods of Hardness test – Vicker's test – Correlation of micro hardness with other properties – Dielectric constant – dielectric loss – conductivity and photoconductivity, thermo gravimetric analysis (TGA) – Differential Thermal analysis DTA) - Differential scanning calorimetry (DSC)

Books for reference:

1,. Crystal growth processes and methods – Dr. P. Santhana Raghavan and Dr. Pl Ramasamy (2000), KRU publications, Kumbakonam.
2. The gowth of crystals from liquid – J.C. Brice, North Holland Publishing Company, Amsterdom, 1986.
3. Fundamentals of Crystallography – C. Giacovazzo (2002), Oxford Science Publications
4. Instrumental methods of analysis H.H. Willard, L.L. Merrit, J.A. Dean and F.A Settle – (2005), CBS publishers, Newdelhi.
5. Material Science and Engineering – V. Raghavan (Third Edition 1993) – Prentice Hall of India .

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

Paper Code: 18PMPPH1CC4 :3 **Guide Name: Dr.G.Selvan**

THIN FILM PHYSICS

Unit I Perspective of Thin Films and Physical Vapor deposition

Need of Thin Films-Science of Thin Films –Technological Relevance of Thin Films-Modern Technology-Physical Vapour Deposition Routes- Thermal Evaporation-Electron Beam Evaporation-Arc Deposition-Pulsed LASER deposition-Ion Plating .

Unit II Chemical Vapor Deposition

Metal Organic Chemical Vapor Deposition Route-Plasma Enhanced Chemical Vapor Deposition Route-Thermally Driven Chemical Vapor Deposition Route- Electrodeposition Technique-Spray Pyrolysis- Solution Growth Technique-Spin Coating Technique- Applications

Unit III Characterization Techniques

Introduction – Hot Probe Method-Non-Destructive Stylus Method –Four Point Probe Technique-Hall Effects Studies – UV-Vis-NIR Spectrophotometer-X ray Diffraction Technique-Low energy electron diffraction (LEED) – Electron microscopy – Scanning Electron Microscopy (SEM)-Energy Dispersive X-ray Analysis-Atomic Force Microscopy-FTIR-Thermal Analysis Technique (TGA & DTA)-Fluorescence Spectrophotometer.

Unit IV Modern Techniques for Materials Studies

Introduction- Optical Spectroscopy - Electron Microscope-Atomic Absorption Spectroscopy-Photoelectron Spectroscopy-Magnetic Resonance –NMR- Electron Spin Resonance (ESR)-Ferromagnetic Resonance (FMR)-Mossbauer Spectroscopy-Non-Destructive Testing (NDT).

Unit V Scope of Nanotechnology

Materials Science and Nanotechnology-Properties of Nano Materials- FULLERENES- Carbon Nano Tubes- DIAMOND and GRAPHITE-Nanoelectronics- Nanoelectronics- Recent Applications

Reference

1. C.M.Srivastava & C.Srinivasan, Science of Engineering Materials and Carbon Nanotubes (New age international Publishers,2012).
2. G.Selvan, Glimpses of Thin Films Preparation and Characterization Techniques, 2008.
3. S.O.Pillai & Sivakami Pillai, Rudiments of Materials Science (New age international Publishers, 2012).
4. L.T. Maissel and Gang, Handbook of Thin Film Technology (McGraw Hill, New York, 1983).
5. A.Goswami, Thin Film Fundamentals (New Age, New York, 1996).

Total Number of Topics Present in the course: 52

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

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

Guide Name: Dr.K.Parivathini **Paper code: 18MPPH1CC4:4**

SPECTROSCOPY

Unit 1: Fundamental principle of spectroscopy

Introduction and regions of electromagnetic radiation - properties of electromagnetic radiation – spectroscopy - Types of spectroscopy -advantages of spectroscopy- Wave properties electromagnetic radiation - ground and excited state - absorption spectra-emission spectra-interaction of electromagnetic radiation with matter- rotational, vibration and electronic energy levels.

Unit 2:Ultraviolet-Visible Spectroscopy

Laws of absorption- derivations from Beers law - measurement of absorption - reasons for derivations from Beer's law – Introduction, principle, construction, working and Applications of Visible Spectrometer

Unit 3:Infrared Spectroscopy

Molecular spectra - origin of infrared spectra- rotational and microwave spectrum - microwave spectroscopy - vibrational energies diatomic and polyatomic molecule - advance in spectrometer, FT-IR - comparison of mid IR, near IR & far IR - characteristic group of frequencies of organic molecule and Applications of Infrared Spectroscopy-uses

Unit 4:Raman spectroscopy

Advantages o f Raman spectroscopy over the Infrared Spectroscopy - discovery of Raman effect - explanation of light scattering in molecule - nature of Raman spectra - app Applications of Raman effect in chemistry - advantage and limitations of Raman spectroscopy – resonance Raman spectroscopy (RRS) - basic principle and experimental technique of CARS - Advantages o f CARS over the Raman normal scattering - disadvantage of CARS - a Applications of CARS

Unit 5:Nuclear Magnetic Resonance (NMR) spectroscopy

Introduction - nuclear spin and magnetic moment – NMR (origin of NMR) - theory of NMR-experimental of NMR - some important aspect of NMR - chemical shift - factors affecting of chemical shift-spin spin coupling - factors affecting of chemical shift - limitations of NMR spectroscopy - Fourier transform (FT) NMR - advantages of FT-NMR - Applications of NMR spectroscopy-use of medical diagnostics-Industrial Applications

Books for reference

1. B.K. Sharma**,** Spectroscopy, Goel publishing house, twelth edition, 2007

2. J. Michael Hollas, Modern spectroscopy, fourth edition, john wiley and sons, 1981

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1.	Local	06
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3.	National	06
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