ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS FOR AFFILIATED COLLEGES
UNDER CBCS PATTERN WITH EFFECT FROM 2022-23 ONWARDS

B.Sc., PHYSICS
Programme Structure

Sem.	Part	Course Code	Courses	Title of the Paper	T/P	Credit	Hours/ Week	Max. Marks		
								Int.	Ext.	Total
I	I	2211T	T/OL	Tamil / Other Language - I	T	3	6	25	75	100
	II	712CE	E	Communicative English –I	T	3	6	25	75	100
	III	22BPH1C1	CC	Mechanics and Properties of Matter	T	5	5	25	75	100
		22BPH1P1	CC	General Physics Practical-I	P	4	4	40	60	100
		-	AL-IA	Mathematics/ Chemistry/ Electronics/Computer Science	T	3	3	25	75	100
		-	AL-IA	Practical - Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BVE1	SEC-I	Value Education	T	2	2	25	75	100
				Library		--	2	--	--	--
				Total		**22**	**30**	**205**	**495**	**700**
II	I	2221T	T/OL	Tamil / Other Language-II	T	3	6	25	75	100
	II	722CE	E	Communicative English –II	T	3	6	25	75	100
		22BPH2C1	CC	Electricity and Electromagnetism	T	5	5	25	75	100
		22BPH2P1	CC	General Physics Practical-II	P	4	4	40	60	100
		-	AL-IB	Mathematics/ Chemistry/ Electronics/Computer Science	T	3	3	25	75	100
		-	AL-IB	Practical - Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BES2	SEC-II	Environmental Studies	T	2	2	25	75	100
				Library		--	2	--	--	--
				Total		**22**	**30**	**205**	**495**	**700**
III	I	2231T	T/OL	Tamil / Other Language-III	T	3	6	25	75	100
	II	2232E	E	English for Enrichment –I	T	3	6	25	75	100
	III	22BPH3C1	CC	Heat and Thermodynamics	T	3	3	25	75	100
		22BPH3C2	CC	Optics	T	3	3	25	75	100
		22BPH3P1	CC	General Physics Practical-III	P	3	3	40	60	100
		-	AL-IIA	Mathematics/ Chemistry/ Electronics/Computer Science	T	3	3	25	75	100

		-	AL-IIA	Practical - Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BE3	SEC-III	Entrepreneurship		2	2	25	75	100
		-	NME-I	Adipadai Tamil/ Advance Tamil/ IT Skill for employment/ MOOC's	T	2	2	25	75	100
				Total		**24**	**30**	**255**	**645**	**900**
IV	I	2241T	T/OL	Tamil / Other Language-III	T	3	6	25	75	100
	II	2242E	E	English for Enrichment –II	T	3	6	25	75	100
	III	22BPH4C1	CC	Atomic Physics	T	4	4	25	75	100
		22BPH4C2	CC	Nuclear Physics	T	4	4	25	75	100
		22BPH4P1	CC	General Physics Practical-IV	P	3	3	40	60	100
		-	AL-IIB	Mathematics/ Chemistry/ Electronics/Computer Science	T	3	3	25	75	100
		-	AL-IIB	Practical – Respective Allied Theory Course	P	2	2	40	60	100
	IV	-	NME-II	Adipadai Tamil/ Advance Tamil/ Small Business management/ MOOC's	T	2	2	25	75	100
				Total		**24**	**30**	**230**	**570**	**800**
V	III	22BPH5C1	CC	Analog Electronics	T	4	4	25	75	100
		22BPH5C2	CC	Computer Programming in C	T	4	4	25	75	100
		22BPH5C3	CC	Classical and Statistical Mechanics	T	4	4	25	75	100
		22BPH5C4	CC	Solid State Physics	T	4	4	25	75	100
		22BPH5P1	CC	General Physics Practical-V	P	4	6	40	60	100
		22BPH5P2	CC	General Physics Practical-VI	P	4	6	40	60	100
				Carrier development / employability skills		-	2	-	-	-
				Total		**24**	**30**	**180**	**420**	**600**
VI	III	22BPH5I	DSE	Internship		**24**	**30**	**150**	**250**	**400**
				OR						
		22BPH6E1		Integrated Electronics	T	6	6	25	75	100
		22BPH6E2		Relativity and Quantum Mechanics	T	6	6	25	75	100
		22BPH6E3		Nano Physics	T	6	6	25	75	100
		22BPH6E4		Laser Physics and Fibre Optics	T	6	6	25	75	100
				Library / Yoga etc.		-	2	-	-	-

				Carrier Development/ Employability skills		-	4	-	-	-
						24	**30**	**100**	**300**	**400**
				OR						
		22BPH6PR		Project		6	10	25	75	100
		22BPH6E1		Integrated Electronics	T	6	6	25	75	100
		22BPH6E2		Relativity and Quantum Mechanics	T	6	6	25	75	100
		22BPH6E3		Nano Physics	T	6	6	25	75	100
			others	Library / Yoga / career development / employability skills / Field trip etc.		-	2	-	-	-
				Total		**24**	**30**	**100**	**300**	**400**
				Grand Total		**140**	**-**	**-**	**-**	**4100**

Sem.	Part	Course Code	Title of the Paper	Cr.	Hrs./ Week	Max. Marks		
						Int.	Ext.	Total
I	III	71BEPP	Professional English for Physical Science - I	4	5	25	75	100
II		72BEPP	Professional English for Physical Science -II	4	5	25	75	100
III		*	Professional English for Physical Science - III	4	5	25	75	100
IV			Professional English for Physical Science - IV	4	5	25	75	100

*The Syllabus of Professional English for III & IV Semester will be provided after Receiving the syllabus from TANSCHE.

As per TANSCHE, the Professional English book will be taught to all four streams apart from the existing hours of teaching/additional hours of teaching (1hour/day) as a 4 credit paper as an add on course on par with Major paper and completion of the paper is a must to continue his/her studies further.

- T/OL-Tamil or Other Language,
- E – English
- CC-Core course –Core competency, critical thinking, analytical reasoning, research skill & team work
- Allied / GEC -Exposure beyond the discipline
- AECC- -Ability Enhancement Compulsory Course (Professional English & Environmental Studies) - Additional academic knowledge, psychology and problem solving etc.,
- SEC-Skill Enhancement Course - Exposure beyond the discipline (Value Education,

Entrepreneurship Course, Computer application for Science, etc.,

- NME -Non Major Elective – Exposure beyond the discipline
- DSE – Discipline specific elective –Additional academic knowledge, critical thinking, and analytical reasoning-Student choice - either Internship or Theory papers or Project + 2 theory paper.
    - If internship – Marks = Internal- 150 (75+75) two midterm evaluation through Viva voce + Report- 150+ External Viva voce- 100 = 400.
    - If Project – Marks = Internal- 50 +Thesis- 100 + Viva voce- 50 = 200 + 2 theory paper- 200 = 400
- MOOCs – Massive Open Online Courses

* T-Theory, P- Practical

Semester - I				
Course Code 22BPH1C1	**Core Course-1**	**T/P**	**C**	**H/W**
	MECHANICS AND PROPERTIES OF MATTER	**T**	**5**	**5**
Objectives	➢ To express the concept of centre of gravity along with its effect on the stability of the objects and also to study the centre of gravity of different systems in real life ➢ To study the laws of gravitation, mass, density and acceleration due to gravity of earth and gravitational field ➢ To understand the properties of elastic bodies and to evaluate the elastic constants of materials ➢ To explain the phenomena of viscosity, surface tension and its utility in fluid dynamics with an understanding of their needs in day-to-day life.			
Unit - I	**Dynamics of Rigid body:-** Moment of inertia – theorems of perpendicular and parallel axes – M.I of a circular disc, solid sphere, hollow sphere and cylinder about all axes – Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k.			
Unit - II	**Gravitation :-** Newton's law of gravitation – Kepler's laws of gravitation – G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth – Value of 'g' at poles and equator – Gravitational field – Gravitational potential – Gravitational potential at a point distant from a body.			
Unit - III	**Central Force Motion:-** Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for acceleration of a body rolling down an inclined plane without slipping – Center of mass – velocity and acceleration of centre of mass – Reduced mass – Principle and velocity of a rocket motion.			
Unit - IV	**Elasticity:-** Elasticity –- Hooke's law – Elastic moduli – Poisson's ratio – Beams – bending of beams – Expression for bending moment –Cantilever- Theory of uniform and non – uniform bending – Determination of young's modulus (Microscopic method) – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body – Torsional pendulum.			
Unit - V	**Surface Tension and Viscosity:-** Surface tension – definition – Explanation of surface tension on kinetic theory – Excess pressure inside a curved liquid surface – Excess pressure inside a spherical and cylindrical drops and bubble – drop weight method – experimental determination. Viscosity – Coefficient of viscosity – Explanation of viscosity on kinetic theory - Streamline and turbulent motion – Poiseuille's formula – experimental determination using Poiseuille's method – viscosity of highly viscous liquid – terminal velocity – Stoke's method			
Reference and Text Books :- Brijlal and Subramaniam S. (2006). *Properties of matter.* New Delhi: S. Chand & Company.				

<table>
<tr><td colspan="2">Gulati H.R. (1982). Fundamentals of General Properties of Matter. New Delhi: S. Chand & Company.

Hallidary D, Resnick and Walker J. (2001). Fundamental of Physics. New York: 6th Edition, Wiley.

Mathur D.S. (2001). Mechanics. New Delhi: S. Chand & Company.

Murugesan R, (2004). Properties of matter. New Delhi: S. Chand & Company.

Narayanamoorthy. (2008). Mechanics – Part I and II. National Publishing Company.</td></tr>
<tr><td>outcomes</td><td>➢ The students will be able to know about the concept of moment of inertia of the rigid bodies
➢ The students gain knowledge on gravity and variation of acceleration due to gravity at different location
➢ The students will be able to know concepts of angular velocity, angular momentum, kinetic energy of rotating body and motion of the rocket with basic principle
➢ The student will be able to identify the materials suitable for constructing buildings, based on the moduli of elasticity.
➢ The students gain knowledge on properties of liquids and its determination</td></tr>
</table>

<table>
<tr><th colspan="6">Semester - I</th></tr>
<tr><td rowspan="2">Course Code
22BPH1P1</td><td colspan="2">Core Practical-1</td><td>T/P</td><td>C</td><td>H/W</td></tr>
<tr><td colspan="2">GENERAL PHYSICS PRACTICAL - I</td><td>P</td><td>4</td><td>4</td></tr>
<tr><td>Objectives</td><td colspan="5">➢ To determine the Young's modulus and Rigidity modulus of the materials using various methods
➢ To compare the viscosities of the given two liquid
➢ To verify the law of transverse vibrations of a stretched string
➢ To determine the specific heat capacity of liquids by heating and cooling process
➢ To carry out the experiments to calculate thermo emf., thermal conductivity and specific heat capacity
➢ To perform optical experiments, to determine the refractive index and dispersive power</td></tr>
<tr><td></td><td colspan="5">Any Seven experiments
1. Uniform bending – Pin and microscope
2. Non – Uniform bending – Optic lever
3. Torsion Pendulum – Determination of rigidity modulus of the wire and moment of inertia of the disc
4. Comparison of Viscosities – Burette
5. Sonometer – verification of the laws of transverse vibrations of a string
6. Oscillation of cantilever
7. Surface Tension – Drop weight method
8. q, n, σ– Searle's method
9. Specific heat capacity of liquid – Newton's law of cooling
10. Spectrometer – Dispersive power of prism</td></tr>
<tr><td>Outcomes</td><td colspan="5">➢ The students will be able to determine the Young's modulus, Rigidity modulus of the materials using various methods, compare the viscosities of the given two liquid, verify the law of transverse vibrations of a stretched string, determine the specific heat capacity of liquid, determine the refractive index and dispersive power .</td></tr>
</table>

Semester - II				
Course Code 22BPH2C1	**Core Course-2**	**T/P**	**C**	**H/W**
	ELECTRICITY AND ELECTROMAGNETISM	**T**	**5**	**5**
Objectives	➢ To provide comprehensive knowledge and understanding the basics of electricity and electromagnetism ➢ To expose the students to the effects of heat, chemical on electric current ➢ To understand the concepts of self induction, mutual induction, Faraday's law and Lenz's laws.			
Unit - I	**Magnetic Effect of Electric Current :-** Biot Savart law – Magnetic induction at a point due to a straight conductor carrying current – Magnetic induction at a point on the axis of a circular coil carrying current – Amperes circuital law – Lorent'z force on a moving charge –Torque on a current loop in a uniform magnetic field –Moving coil Ballistic galvanometer – theory –experiment to find charge sensitivity.			
Unit - II	**Thermal and Chemical Effect of Electric Current:-** Thermoelectricity –Seebeck effect- laws of thermo e.m.f – measurement of thermo e.m.f. using potentiometer – Peltier effect – demonstration – Thomson effect- Thermodynamics of thermo couple – Thermo electric diagram – uses – Applications – Boy's radio micrometer. Faradays laws of electrolysis – Electrical conductivity of an electrolyte – specific conductivity – Kohlrausch's bridge method.			
UNIT- III	**Electromagnetic Induction:-** Faraday's laws of electromagnetic induction-self induction – self inductance of a long solenoid – determination of L by Anderson's method – mutual induction – mutual inductance between two co-axial coils – experimental determination of mutual inductance – coefficient of coupling- energy stored in a coil – eddy currents –uses.			
UNIT- IV	**AC And DC Circuits:-** Growth and decay of current in LC, LR and CR circuits with d.c. voltages – determination of high resistance by leakage – growth and decay of charge in LCR circuit –conditions for the discharge to be oscillatory –frequency of oscillation. Alternating Current – capacitance and resistance in series – LCR series resonance circuit – sharpness of resonance – parallel resonance circuit – power in an AC circuit – power factor.			
UNIT- V	**Maxwell's Equation & Electromagnetic Waves:-** Introduction – Maxwell's equations – Displacement current- Poynting vector – Electromagnetic waves in free space – Hertz experiment for production and detection of EM waves – Wave equations for Electric field and Magnetic field – monochromatic plane waves – E.M.waves in a matter – reflection and transmission at normal incidence.			
Reference and Text Books :- BrijLal & Subramanyam S. (2005). *Electricity and Magnetism.* Agra: Ratan Prakashan Mandir Publishers.				

<table>
<tr><td colspan="2">David J. Griffith (2012). Introduction to Electrodynamics. New Delhi: PHI.

Halliday D., Resnick R. and Walker J.(2011). Fundamentals of Physics – Electricity and Magnetism. India : Wiley India Private Limited

Murugeshan R. (2008).Electricity and Magnetism. New Delhi: S Chand & Company.

Narayanamoorthy M. and Nagarathinam N. (1990). Electricity & Magnetism.. Chennai: Revised edition edition, National publishing Co.

Pourcel E.M. (2010) Electricity and Magnetism. Berkley Physics Cource, Volume-2 .Mc Graw-Hill company

Tiwari K.K. (2012). Electricity and Magnetism. New Delhi: S Chand & Company.</td></tr>
<tr><td>outcomes</td><td>➢ The students will be able to understand the fundamental laws of electricity and electromagnetism, identify the chemical, thermal and magnetic effects of electric current, and analyses and solve electrical circuits with dc and ac source
➢ To understand electromagnetic induction and different types of ac and dc circuits
➢ The student gain knowledge of electromagnetic waves and their propagation.</td></tr>
</table>

Semester - II				
Course Code 22BPH2P1	**Core Practical-2**	**T/P**	**C**	**H/W**
	GENERAL PHYSICS PRACTICAL-II	**P**	**4**	**4**
Objectives	➢ To determine the Young's modulus and rigidity modulus of the materials using various methods ➢ To determine the acceleration due to gravity a place using different methods ➢ To find the viscosities of the given two liquid ➢ To verify the law of transverse vibrations of a stretched string ➢ To find the frequency of the alternating current supplied to our area ➢ To perform optical experiments to determine the refractive index and dispersive power			
	Any Seven experiments 1. Uniform bending – Optic lever 2. Non – Uniform bending – Pin and microscope 3. Compound Pendulum 4. Static torsion method – Rigidity modulus 5. Viscosity – Searle's method 6. Sonometer – Frequency of tuning fork and relative density of a solid 7. Bifilar Pendulum 8. Sonometer – AC frequency 9. Depression of a Cantilever 10. Spectrometer – Refractive index of a solid prism			
Outcomes	➢ The students will be able to determine the Young's modulus and rigidity modulus of the materials, determine the acceleration due to gravity a place, find the viscosities of the given two liquid, verify the law of transverse vibrations of a stretched string, find the frequency of the alternating current, the refractive index and dispersive power			

Semester - III				
Course Code 22BPH3C1	**Core Course-3**	**T/P**	**C**	**H/W**
	HEAT AND THERMODYNAMICS	**T**	**3**	**3**

Objectives	➢ To elaborate, the basic principles of heat and its transformation process ➢ To explore the idea of lowering the temperature ➢ To understand the concept of entropy ➢ To understand the kinetic theory of gases
Unit - I	**Thermometry and Calorimetry:-** Thermoelectric effect – Thermoelectric thermometers - Specific heat capacity of solids – Regnault's method of mixtures(solid) – specific heat capacity of liquids – Callendar and Barnes method – Specific heat capacity of gases – C_p and C_v – Meyer's relation – C_v by Joly's differential steam calorimeter method – C_p by Regnault's method.
Unit - II	**Thermodynamics:-** Reversible and irreversible processes – isothermal and adiabatic process - work done during adiabatic and isothermal process - second law of thermodynamics – Carnot's engine – its efficiency. Entropy – change of entropy in reversible and irreversible processes – temperature-entropy diagrams – change of entropy when ice converted into steam.
Unit - III	**Low Temperature Physics:-** Joule - Kelvin effect - Liquefaction of Air-Linde's Process – liquefaction of hydrogen - liquefaction of helium(Kammerling - Onne's method) –Helium I and II – super fluidity – Lambda point – production of low temperatures – adiabatic demagnetization.
Unit - IV	**Transmission of Heat :-** Conduction – coefficient of thermal conductivity– Convection – lapse rate – green house effect – Newton's law of cooling – determination of specific heat capacity of liquid - Radiation - black body – energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law (No derivation) - solar constant – water flow pyroheliometer.
Unit - V	**Kinetic Theory of Gases:-** Postulates of Kinetic Theory of gases – Brownian motion and its features - expression for viscosity, diffusion and thermal conductivity of gas – experimental verification - Vander walls equation of state - Determination of Vander walls constant - relation between Vander Wall's constant and critical constants.

Reference and Text Books :-

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

Mathur D.S. (2014). *Heat and Thermodynamics*. New Delhi: 5th Edition & Company.

Murughesan R. Kiruthiga Sivaprasath. (2008). *Thermal Physics*. New Delhi: II Edition S.Chand & Co

Narayanamoorthy M. and Nagarathinam N. (1987). *Heat.* Chennai: Eight edition, National

<table>
<tr><td colspan="2">publishing Company.

Rajan J.B. (1985). Heat & Thermodynamics. New Delhi: S. Chand Publisher.

Varma H.C. (2015). Concepts of Physics Volume I and II. New Delhi: Bharati Bhawan Publishers.</td></tr>
<tr><td>Outcomes</td><td>➢ The student will be able to learn the transmission of heat by the various process by studying experiments
➢ The students gain knowledge of the laws of thermodynamics and their applications
➢ The students will be motivated to carry out research in Heat and Thermodynamics and its related fields</td></tr>
</table>

Semester - III				
Course Code 22BPH3C2	**Core Course-4**	**T/P**	**C**	**H/W**
	OPTICS	**T**	**3**	**3**
Objectives	➢ To understand the various types of aberrations in the lenses and prisms and their elimination process ➢ To elaborate the concept of dispersion, dispersive power and the formation of rainbows ➢ To study the basic concepts of interference, diffraction and polarization and the various applications			
Unit - I	**Geometrical Optics:-** Aberrations – Spherical aberration in lenses – defects in lenses – Methods of minimizing spherical aberration – Condition for minimum spherical aberration of two thin lenses separated by a distance – Chromatic aberration in lenses – Condition for achromatism of two thin lenses (in contact and out of contact) – Ramsden and Huygen's eyepieces – Comparison of eyepieces.			
Unit - II	**Dispersion:-** Dispersion produced by a prism – angular dispersion – dispersive power – Cauchy's formula – achromatism in prisms – deviation without dispersion- Dispersion without deviation – Direct vision spectroscope – constant deviation spectroscope – Rainbow – Theory of primary rainbow and secondary rainbow.			
Unit - III	**Interference:-** Conditions for interference – Theory of interference fringes – interference due to reflected light (thin films) – colours of thin films – wedge shaped thin film – test for optical flatness – Newton's rings by reflected light – Determination of wavelength of light – Michelson's Interferometer – theory and its application (measurement of wavelength).			
Unit - IV	**Diffraction:-** Fresnel's diffraction – rectilinear propagation of light – zone plate –action of zone plate -diffraction at circular aperture– Fraunhofer diffraction at single slit – Double slit – Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength(Normal incidence method) –resolving power– Rayleigh's criterion for resolution– resolving power of a microscope – resolving power of a prism.			
Unit - V	**Polarisation:-** Double refraction – Huygens's explanation of double refraction in uniaxial crystals– Plane, elliptically and circularly polarized light – Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light- Optical activity– Fresnel's explanation of optical activity – Specific rotatory power –Laurent's half shade polarimeter.			

Reference and Text Books :-

Ajoy Ghatak (2009). *Optics.* New Delhi: IV Edition, Tata Mcgraw Hill Publishing Company.

Banewell C.N. (2006). *Introduction to Molecular Spectroscopy.* New Delhi: IV Edition, Tata Mcgraw Hill Publishing Company.

<table>
<tr><td colspan="2">Hallidary D, Resnick and Walker J. (2001). Fundamental of Physics. New York: 6th Edition, Wiley.

Murugesan R. (2008). Optics and Spectroscopy. New Delhi: S. Chand & Company.

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

Singh and Agarwal. (2002). Optics and Atomic Physics. Nineth edition Pragati Prakashan Meerut.

Subramanyam and Brijlal. (2004). A text book of Optics. New Delhi: S. Chand & Company.</td></tr>
<tr><td>Outcomes</td><td>➢ The students understand the principles of geometric optics, which helps in the practical design of many optical systems and instruments
➢ The students will be able to understand the interference, diffraction, and polarization phenomena, laying the foundation for understanding concepts such as holograms and interferometers.
➢ The students will know the concept of polarization, which helps to find the optical activity of substances and their rotatory power.</td></tr>
</table>

Semester - III				
Course Code 22BPH3P1	**Core Practical-3**	**T/P**	**C**	**H/W**
	GENERAL PHYSICS PRACTICAL - III	**P**	**3**	**3**
Objectives	➢ To carry out the experiments, to calculate thermo emf, thermal conductivity and specific heat capacity ➢ To construct the electrical circuits to measure voltage to calibrate voltmeter ➢ To find the resistance and temperature coefficient of the given wire ➢ To find the surface tension of the given liquid ➢ To find the thickness of a thin wire by forming interference frings in the wedge shaped air film			
	Any Seven experiments 1. Melde's string – transverse and longitudinal mode 2. Surface tension – Capillary rise 3. Spectrometer – i-d curve 4. Calibration of low range Voltmeter - Potentiometer 5. Carey- Foster Bridge – Specific resistance and Temperature Coefficient 6. Air wedge – Thickness of thin wire 7. Deflection magnetometer – Tan A and Tan B Position 8. Thermal conductivity – Lee's disc method 9. Thermal conductivity of rubber 10. Specific heat capacity of liquid – Joule's Calorimeter			
Outcomes	➢ The students gain knowledge to calculate and determine thermo emf, thermal conductivity, Specific heat capacity, constructing electrical circuits to measure voltage to calibrate voltmeter, the resistance and temperature coefficient of the given material, the surface tension of the given liquid, and to find the thickness of a thin wire by forming interference fringes			

Semester - IV				
Course Code 22BPH4C1	**Core Course-5**	**T/P**	**C**	**H/W**
	ATOMIC PHYSICS	**T**	**4**	**4**

Objectives	➢ To study about the properties of positive rays and photo electric effect and its applications ➢ To understand the evolution of different atomic models and their merits and limitations ➢ To know the effect of application of magnetic and electric fields on atomic spectra and X-rays.
Unit - I	**Positive Rays:-** Discovery – properties – analysis – Thomson's parabola method – Aston's mass spectrograph – Bainbridge's mass spectrograph – Dempster's mass spectrograph – Dunnington's method of determining e/m. – Franck and Hertz's method – Davis-Goucher experiment
Unit - II	**Photo Electricity:-** The nature of Photo-particles – Photoelectric emission laws – Lenard's method to determine e/m for photoelectrons – Richardson & Compton experiment – Einstein's Photoelectric equation and its verification by Millikan's experiment. **Photoelectric cells:** Photo emissive cell – Photo voltaic cell- Photo conductive cell- Applications
Unit - III	**Atomic Structure:-** Bohr atom model – Bohr's interpretation of the Hydrogen spectrum – correction for nuclear motion – evidences in favour of Bohr's theory – correspondence principle – Sommerfield's relativistic atom model – drawbacks – The vector atom model – Quantum numbers associated with the vector atom model – Pauli's exclusion principle – periodic classification of elements.
Unit - IV	**Fine Structure Of Spectral Lines:-** Coupling schemes – L-S Coupling – j-j Coupling – Hunds rules – magnetic dipole moment due to orbital motion of the electron – due to spin of the electron – Stern and Gerlach experiment – Normal Zeeman effect – theory and experiment – quantum mechanical explanation – Larmor's theorem – Anomalous Zeeman effect – Paschen –Bach effect – Stark effect.
Unit - V	**X-Rays and Photo Electric Effect:-** Production of X-rays – properties-absorption of X-rays – X-ray absorption edges-Bragg's law – Bragg's x-ray spectrometer – the powder crystal method – Laue's method – rotating crystal method – characteristic spectra – Moseley's law – importance – Compton effect – theory and experimental verification. Photo Electric Effect – Einstein's photoelectric equation – photoelectric cells.

Reference and Text Books :-

Beiser A. (1997). *Concepts of Modern Physics*. New Delhi: Tata McGraw-Hill Publications.

Hallidary D, Resnick and Walker J. (2001). *Fundamental of Physics*. New York: 6th Edition, Wiley.

Hamilton J.H. and Yang. (1996). *Modern Physics*. New Delhi: McGraw-Hill Publication.

Kenneth S. Krane. (1998). *Modern Physics.* Canada: John Willey & sons.

<table>
<tr><td colspan="2">Murugeshan KiruthigaSivaprasath R.. (2008). Modern Physics. New Delhi: S. Chand & Company.

Rajam J.B. (2004). Atomic Physics . New Delhi: S. Chand & Company.

Sehgal D.L. Chopra K.L. Sehgal N.K.. (1991). Modern Physics. New Delhi: S. Chand & Company.

Subrahmanyam N. BrijLal. (2000). Atomic and Nuclear Physics. New Delhi: S. Chand & Company.</td></tr>
<tr><td>Outcomes</td><td>➢ The students will be able to understand the evolution of different atomic models and their merit and limitations
➢ The students will gain adequate knowledge of the fundamental principles governing the structure of the atom and the interactions
➢ The students will gain sufficient expertise in atomic physics to follow courses at the advanced level</td></tr>
</table>

Semester - IV				
Course Code 22BPH4C2	**Core Course-6**	**T/P**	**C**	**H/W**
	NUCLEAR PHYSICS	**T**	**4**	**4**

Objectives	➢ To acquire the knowledge of fundamental Nuclear properties and apply the concepts to calculate various parameters of the nucleus ➢ To understand the theoretical concepts of nuclear models ➢ To elaborate the working of nuclear reactors and their application in daily life. ➢ To study how to detect nuclear radiation and accelerate particles
Unit - I	**Properties and structure of Nuclei:-** General properties of nucleus – proton electron theory– proton neutron theory binding energy – binding energy and mass number curve – significance –Nuclear forces – characteristics – Semi empirical mass formula – Nuclear models (Liquid drop model).
Unit - II	**Radio Activity:-** Fundamental laws of radio activity – theory of α ,β and ϒ decay- properties of alpha, beta and gamma rays – neutrino and its properties-electron capture – nuclear isomers – Mossabauer effect – applications– Radio carbon dating – radio isotopes – uses.
Unit - III	**Nuclear Reactions :-** Kinematics of nuclear reaction-Nuclear fission – Nuclear fusion – Nuclear reactor– uses – atom bomb – hydrogen bomb-fusion reactor –plasma confinement – artificial transmutation – Q- value of nuclear reaction–types of nuclear reaction
Unit - IV	**Nuclear Detectors and Particle Accelerators:-** Neutron sources and properties – detectors – G.M.counter – scintillation counter– bubble chamber – Wilson cloud chamber – accelerators – cyclotron– synchrocyclotron – betatron.
Unit - V	**Cosmic Rays and Elementary Particles:-** Cosmic rays–introduction–discovery – latitude, altitude and azimuth effects– longitudinal effect–north-south effect – primary and secondary cosmic rays – cosmic ray showers-Van Allen belt–origin of cosmic radiation. Elementary particles – particles and antiparticles – antimatter—he fundamental interaction – elementary particle quantum numbers – conservation laws and symmetry – the quark model

Reference and Text Books :-

Irving Kaplan. (2002). *Nuclear Physics*. New Delhi: Narosa Publishing house.

Longo. (1998). *Fundamentals of Elementary Particle Physics*. New Delhi: Tata McGraw-Hill Publications.

Pandya M.L. Yadav R.P.S. (2008). *Elements of Nuclear Physics*. Meerut: Kedarnath Ram Nath.

Roy R.R.and Nigam B.P. (1997). *Nuclear Physics*. NewDelhi: New Age International (P) Ltd.

Serge., W.A. Benjamin . (2004). *Nuclei and Particles*. USA .

Sharma R.C. (2000). *Nuclear Physics*. Meerut : K.Nath& Co.

Subrahmanyam N. and Brijlal. (1996). *Atomic and Nuclear Physics*. New Delhi: S. Chand & Co.

Tayal D.C. (2006). *Nuclear Physics*. Mumbai: Himalaya Publishing House.	
Outcomes	➢ The students will be able to understand the basics of nuclear physics ➢ The students gain knowledge about particle-antiparticle, decay processes and the working of particle accelerators and detectors ➢ The students will be able to learn about the primary interaction between fundamental particles

Semester - IV				
Course Code 22BPH4P1	**Core Practical-4**	**T/P**	**C**	**H/W**
	GENERAL PHYSICS PRACTICAL - IV	**P**	**3**	**3**
Objectives	➢ To construct the electrical circuits to measure current and voltages to calibrate ammeter, high range voltmeter, and to determine the unknown resistance ➢ To carry out the experiments to calculate thermo emf, thermal conductivity and Specific heat capacity ➢ To determine the wavelength of the most prominent lines in the mercury spectrum by the angle of diffraction ➢ To find the radius of curvature of the lens and wavelength of the given source by forming interference pattern			
	Any Seven experiments 1. Calibration of ammeter – Potentiometer 2. Field along the axis of a coil – Deflection magnetometer 3. Newton's ring method – radius of curvature of biconvex lens 4. Small angle prism – Spectrometer 5. Comparison of low resistances – Potentiometer 6. Comparison of low resistance using spot galvanometer/BG 7. Calibration of high range Voltmeter - Potentiometer 8. Figure of merit – spot galvanometer/BG 9. Determination of mutual inductance – spot galvanometer/BG 10. Thermo emf. – Potentiometer			
Outcomes	➢ The students will be able to construct the electrical circuits to measure current, and voltages, calibrate the ammeter, and high range voltmeter, determine the value of the given resistance and calculate the thermo emf, thermal conductivity, and Specific heat capacity. He will be also able to determine the wavelength of the most prominent lines in the mercury spectrum and find the radius of curvature of the lens and wavelength			

Semester - V				
Course Code 22BPH5C1	**Core Course-7**	**T/P**	**C**	**H/W**
	ANALOG ELECTRONICS	**T**	**4**	**4**

Objectives	➢ To impart basic knowledge on semiconductor and their applications ➢ To understand the concepts for solving real-time problems related to electronic circuits ➢ To develop the ability to design and analyse the circuit containing diode, transistor and operational amplifiers ➢ To elaborate on the basics of special types of semiconductor devices
Unit - I	**Linear circuit analysis and semiconductor diodes :-** PN junction – V-I characteristics of a PN junction diode – Half wave rectifier – Bridge rectifier – Efficiency – filters – pi filter – Zener diode – equivalent circuit – voltage regulator – LED – V-I characteristics – advantages – applications – photo diode – characteristics -applications.
Unit - II	**Transistor Amplifier:-** Transistor - Different modes of operations – CB mode &CE mode –Two port representation of a transistor – h-parameter – AC equivalent circuit using h parameters – analysis of amplifiers using h parameters (CE only) – RC coupled amplifier – transformer coupled amplifier – power amplifier – classification of amplifiers – Class A, Class B and Class C amplifiers - Push pull amplifier.
Unit - III	**Oscillators and Multivibrator:-** Feedback principle -Effect negative feedback – Barkhaussen criterion – Hartely, Colpitt and Phase shift oscillators using transistors – Expression for frequency – multivibrators – astable, monostable and bistable multi vibrators using transistors.
Unit - IV	**Special Semiconductor Devices:-** Clipping and clamping circuits - Differentiating circuit - Integrating circuit –- Junction Field effect Transistor (JFET) – MOSFET – FET as a Voltage variable resistor – UJT – UJT relaxation oscillator – SCR – characteristics – SCR as a switch.
Unit - V	**Operational Amplifier:-** Operational amplifier – characteristics – parameters-applications – Inverting amplifier– Non inverting amplifier – adder – subtractor – integrator – differentiator – comparator – square wave generator – Wien bridge oscillator –Schmitt trigger.

Reference and Text Books :-

Bagde M.K. Singh S.P. (1990). *Elements of Electronics*. New Delhi: S. Chand & Company.

Gupta and Kumar. (2002). *Hand Book of Electronics*. Meerut : PragatiPrakashan.

Mehta V.K., Rohit Mehta. (2006). *Principles of Electronics*. New Delhi: S. Chand & Company.

Mittal.G.K. (1993). *Electronic Devices*. G.K. Publishers Pvt. Ltd.

Ramakant A. Gayakwad. (1994). *OP - AMPs and Linear Integrated Circuits*. India : Prentice Hall.

Subramanyam A.(1997). *Applied Electronics*. National Publishing Company.

Theraja B.L. (2008). *Basic Electronics* . New Delhi: S. Chand & Company.

Outcomes	➢ The students will familiarize themselves with network theorems like

	Thevenin's theorem, Norton's theorem etc., ➢ The students gain knowledge about the working principle of semiconducting devices such as p-n junctions, Zener diodes, Transistors, UJT, FET, SCR and working mechanism ➢ The students will be able to understand the working of amplifiers, oscillators, multivibrators and operational amplifiers

Semester - V				
Course Code 22BPH5C2	**Core Course-8**	**T/P**	**C**	**H/W**
	COMPUTER PROGRAMMING IN C	**T**	**4**	**4**

Objectives	➢ To introduce a computer language for solving scientific problems ➢ To elaborate on different data types, such as simple variables, strings and arrays ➢ To familiarize students with writing programs using functions and pointers
Unit - I	**Fundamentals:-** The character set – identifiers and keywords – data types – constants – variables – declarations – expressions – Library functions. **Operator and expressions:** Arithmetic operators – Relational and Logical operator – Assignment operator – Conditional operator and Bit wise operator. **Data input and output:** The get char functions – the put char function – scanf function – printf function – gets and puts function.
Unit - II	**Control Statements and Arrays:-** **Branching statement:** The if and if-else statement – nested if statement-the switch statement - the goto statement. **Looping statement:** while statement - do–while statement –for statement –break statement – continue statement. Defining an array – declaring, initializing one dimensional – two dimensional – multidimensional arrays – reading and writing strings.
Unit - III	**Functions:-** Defining a function – Accessing a function – declaration a function – function prototypes – passing Arguments to a function – categories of function – Recursion. Storage classes – Automatic variables – External variables – Static variables – Register variables.
Unit - IV	**Pointers and Structures:-** Pointers – Pointer declaration – accessing pointer variables – pointers and one dimensional arrays – passing pointers to a function – call by value and call by reference – Arrays of pointers. Defining a structure – declaring structure variable – accessing structure members – processing structures – arrays of structures.
Unit - V	**Programs:-** Writing Programs – Average of set of numbers – Conversion of Celsius to Fahrenheit – Factorial of a given number – Roots of a quadratic equation – Add/Subtract two matrices – Evaluation of sine series – Smallest and largest number of an array – Sorting numbers in ascending / descending order using function –Arranging the names in alphabetical order.

Reference and Text Books :-

Balagurusamy V. (2004). *Programming in ANSI C*. New Delhi:Tata Mcgraw Hill Publishing Company.

Byron Gottfried (1994). *Programming in C*. New Delhi:Tata Mcgraw Hill Publishing Company.

Ravichandran D. (2002). *Programming in C* . New Delhi: I Edition, New Age International

Stephen G.Kochen. (1998). Programming in C. New Delhi : III Edition, Developers Library

Outcomes	➢ The students will be able to acquire skills in writing his program for simple problems in general, Physics in particular ➢ The students will get the self-confidence to self-learning any other programming languages and use them to solve numerical problems ➢ Enhancing student's chance in the job haunt

Semester - V				
Course Code 22BPH5C3	**Core Course-9**	**T/P**	**C**	**H/W**
	CLASSICAL AND STATISTICAL MECHANICS	**T**	**4**	**4**

Objectives	➢ To explain the basic principle of properties in Classical Mechanics and Statistical Physics ➢ To learn the Lagrangian and Hamiltonian and their applications ➢ To study the concept of statistics of molecules
Unit - I	**Mechanics of a System of Particles:-** External and internal forces – centre of mass - Conservation of linear momentum – Conservation of angular momentum – conservation of energy – work-energy theorem-Conservative forces – examples – constraints – types of constraints –examples – degrees of freedom – generalized coordinates – generalized velocities – generalized Momentum.
Unit - II	**Lagrangian Formulations:-** Principle of virtual work – D'Alembert's principle, Lagrange's equation of motion for conservative and non conservative systems- applications – simple pendulum – Atwood's machine –Hamilton's principle – Deduction of Lagrange's equation of motion from Hamilton's principle.
Unit - III	**Hamiltonian Formulations:-** Phase space –the Hamiltonian function H – Hamilton's Canonical equation of motion-Physical significance of H – Deduction of Canonical equation from a variation principle – applications – compound pendulum .
Unit - IV	**Classical Statistics :-** Micro and macro states – the mu-space and gamma space-fundamental postulates of statistical mechanics-Ensembles – different types –Thermo dynamical probability – entropy and probability-Boltzmann's theorem–Maxwell-Boltzmann statistics – Maxwell-Boltzmann energy distributive law – Maxwell-Boltzmann velocity distributive law.
Unit - V	**Quantum Statistics:-** Development of Quantum statistics– Bose-Einstein and Fermi-Dirac statistics – Derivation of Planck's radiation formula from Bose – Einstein statistics – Free electrons in metal- Fermi gas –Difference between classical and quantum statistics

Reference and Text Books :-

Brijlal & Subramaniam, Reprint 1998, *Heat & Thermodynamics*. New Delhi: S. Chand & Company.

Gupta, Kumar, Sharma.(2005). *Classical Mechanics*, Meerut: Pragati Prakashan Publishers.

Gupta,B.D., Satyaprakash. (1991). *Classical Mechanics*. Meerut: 9th ed., Kadernath Ramnath Publishers.

Murray R.Siegal (1981). *Theoretical Mechanics*. New Delhi: Tata Mcgraw Hill Publishing Company.

Upadhyaya J.C. (2005). *Classical Mechanics*, Mumbai : Himalya Publishing House

Outcomes	➢ The students will be able to understand the usage of Lagrangian and Hamiltonian Mechanics ➢ The students gain knowledge to apply the principles of Statistical Mechanics to solve the system of molecules and atoms

Semester - V				
Course Code 22BPH5C4	**Core Course-10**	**T/P**	**C**	**H/W**
	SOLID STATE PHYSICS	**T**	**4**	**4**

Objectives	➢ To understand the different types of bonding in solids ➢ To understand the magnetic and dielectric properties of crystalline structures ➢ To acquire knowledge of the basics of magnetic phenomena on materials and various types of magnetization. ➢ To know the properties of superconducting materials.
Unit - I	**Bonding in Solids:-** Types of bonds in crystals – Ionic, covalent, Metallic, Vanderwaal's and Hydrogen Bonding – Bond energy of sodium chloride molecule – variation of inter atomic force with inter atomic spacing –cohesive energy – cohesive energy of ionic solids – application to sodium chloride crystal –evaluation of Madelung constant for sodium chloride.
Unit - II	**Crystal Structure and Crystal Diffraction:-** Crystal Lattice – Primitive and unit cell – seven classes of crystal – Bravais Lattice – Miller Indices – Structure of crystals – simple cubic, face centered cubic and body centered cubic – Sodium chrloride, Zinc blende and Diamond Structures. Crystal Diffraction – Bragg's law – Experimental methods – Laue method – powder method and rotating crystal method.
Unit - III	**Magnetic Properties:-** Different types of magnetic materials – Langevin Theory of Diamagnetism – Weiss theory of para magnetism – Weiss Theory of ferromagnetism – Temperature dependence of Magnetization – Domain theory of Ferromagnetism – Bloch wall – Applications of magnetic materials.
Unit - IV	**Dielectric Properties:-** Band theory of solids – classification of insulators, Semiconductors, conductors – intrinsic and extrinsic semiconductor – Polarization – frequency and temperature effects on polarization-dielectric loss – Clausius Mosotti relation – Classical Theory of electric polarizability. Normal and Anomalous Dispersion. Langevin – Debye equation – Determination of dielectric constants.
Unit - V	**Super Conductivity:-** Introduction - General Properties of Superconductors – effect of magnetic field – Meissner effect – effect of current – thermal properties – entropy – specific heat –energy gap – Josephson effect – applications – Type-I and Type-II superconductors – Explanation for the occurrence of Super Conductivity – BCS theory – application of Superconductors .

Reference and Text Books :-

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

Dekker A. (1985). J *Solid State Physics* . India: Macmillan .

Gupta H.C. (2001). *Solid State Physics*, New Delhi: Vikas Publishing House Pvt. Ltd.,

RaghavanV. (2004). *Materials Science and Engineering*, Prentice Hall of India Private Ltd.,

<table>
<tr><td colspan="2">New Delhi
Pillai S.O.(2002). Solid State Physics. New Delhi: New Age International (P) Ltd.
Singhal R.L. (2003). Solid State Physics. Meerut : Kedarnath Ram Nath& Co.,</td></tr>
<tr><td>Outcomes</td><td>➢ The students will be able to understand the inter-atomic forces and bonds between solids
➢ The students will be able to understand the behavior of solids with their magnetic properties
➢ The students gain knowledge about the superconducting materials</td></tr>
</table>

Semester - V				
Course Code 22BPH5P1	**Core Practical-5**	**T/P**	**C**	**H/W**
	GENERAL PHYSICS PRACTICAL - V	**P**	**4**	**6**
Objectives	➢ To find the resonance frequency of series and parallel LCR circuits ➢ To determine the wavelength of most prominent lines in the mercury spectrum by angle of diffraction ➢ To understand the concept and determination of self inductance ➢ To know how run and execute a C program in the computer ➢ To compare the given capacitances, voltages and resistors			
	Any Seven experiments 1. Series resonance and Parallel resonance of a LCR circuit 2. Spectrometer -Grating – Normal incidence and Minimum deviation methods 3. Comparison of capacitance and emf. – Spot galvanometer/BG 4. Determination of absolute capacitance – Spot galvanometer/BG 5. Hartmann's interpolation formula – Spectrometer 6. High resistance by leakage – Spot galvanometer/BG 7. Determination of L –Anderson's bridge and Maxwell's bridge method 8. Determination of band gap of a semiconducting diode and Boltzmann's constant using Transistor 9. Electro chemical equivalent and charge of an electron – Copper voltmeter 10. C Programming - Roots of quadratic equation and biggest number of an array			
Outcomes	➢ The students will be able to know about resonance frequency and its determination of LCR circuits ➢ The students will be able to determine the wavelength of most prominent lines in the mercury spectrum by angle of diffraction using grating ➢ The students will be able to understand the concept and determination of self inductance ➢ The students will be able to run and execute C programs in the computer			

<table>
<tr><th colspan="5">Semester - V</th></tr>
<tr><td rowspan="2">Course Code
22BPH5P2</td><td>Core Practical-6</td><td>T/P</td><td>C</td><td>H/W</td></tr>
<tr><td>GENERAL PHYSICS PRACTICAL -VI</td><td>P</td><td>4</td><td>6</td></tr>
<tr><td>Objectives</td><td colspan="4">➢ To study the characteristics of semiconducting devices and its application
➢ To know how to construct a power supplies, amplifiers and oscillators by various methods
➢ To understand the basic concept adding, subtracting, multiplication and division are done using integrated circuit</td></tr>
<tr><td></td><td colspan="4">Any Seven experiments
1. Zener diode – characteristics and construction of voltage regulator
2. Transistor characteristics (CE mode) and construction of Single stage amplifier
3. Construction of Bridge rectifier and Dual power supply
4. Hartley oscillator and Colpitts oscillator – Transistor
5. FET characteristics and amplifier
6. Logic gates using integrated circuits and discrete components
7. Verification of De Morgan’s Theorem and solving a simple Boolean equations
8. NAND and NOR as universal gates
9. RS and JK flipflops
10. Astable and bistable multivibrators - using 555 Timer ICs
11. Adder, Subtractor, Differentiator and Integrator – Op.amp</td></tr>
<tr><td>Outcomes</td><td colspan="4">➢ The students will be able to understand the characteristics and usage of diodes, transistor.
➢ They will be able to design and construct power supplies, amplifiers and oscillators
➢ The students will be able to understand of concept of addition, subtraction, multiplication and division through logic circuits. He will also able to understand, working of flip flops, multivibrator using integrated circuits.</td></tr>
</table>

Semester - VI				
Course Code 22BPH6E1	**DSE-1**	**T/P**	**C**	**H/W**
	INTEGRATED ELECTRONICS	**T**	**6**	**6**

Objectives	➢ To know various number systems and conversion from one type to other ➢ To understand the fundamental concepts of logic gates, counters, registers, etc. ➢ To understand the process of encoding and decoding in electronic circuits ➢ To exhibit proficiency in the basic concepts of circuit analysis involving timer integrated circuits
Unit - I	**Fundamental Digital Electronics:-** Number systems – binary – Octal – hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – multiplication - division – BCD – Conversion – simplification of logic circuits - using Boolean algebra - Demorgan's theorems.
Unit - II	**Combinational Logic Circuits:-** Basic logic gates – X-OR gate -NAND and NOR as universal building blocks - Sum of Products method - Karnaugh map –Pairs, Quads and Octets – Karnaugh simplification- Don't care condition – Product of sum method – POS simplification.
Unit - III	**Data Processing and arithmetic circuits:-** Multiplexer – Demultiplexer – 1 of 16 decoder – BCD to decimal decoders - Seven segement decoders – encoder – Exclusive OR gates – Parity generator and checkers - Half adder–full adder– half subtractor – full subtractor – 4 bit adder/subtractor .
Unit - IV	**Sequential Logic Circuits:-** R-S flip flop – D-flip flop – Clocked flipflops – J-K flip flops – J-K Master Slave flip flop – synchronous and ripple counters – BCD counter – Up/Down counters – shift registers – serial and parallel registers – ring and twisted ring counter.
Unit - V	**Timer, DA/AD Conversion:-** Timer 555 - Internal block diagram and working – astable, monostable and bistable multivibrators – Schmitt trigger. Variable resistor network – Binary ladder - D/A converter – D/A converter accuracy and resolution – A/D converter – simultaneous conversion - successive approximation method – A/D accuracy

Reference and Text Books :-

Jain R.P.(1996). *Digital Electronics by Practice Using Integrated Circuits* - Tata McGrawHill(1996).

Malvino Leach. (1992). *Digital Principles and Application* . New Delhi: 4thEdition Tata Mcgraw Hill Publishing Company.

Millman J. Halkias C. (2001). *Integrated Electronics*. New Delhi: Tata McGraw Hill

Nagrath I.J. (1999). *Electronics - Analog and Digital* . NewDelhi: Prentice - Hall of India,

Roy Choudhury D. Shail Jain. (2003). *Linear Integrated Circuits*. New Age International Private Ltd.

Thomas L. Floyd.(1998). *Digital Fundamentals*. New Delhi: Universal Book Stall,

Vijayendran V., Viswanathan S. (2005). *Introduction to Integrated Electronics.* Chennai: Printers and Publishers Pvt. Ltd.

Outcomes	➢ The students will be able to know how primitives of Boolean algebra are used to describe the processing of digital signals. ➢ The students gain knowledge in designing and analyzing the electronic circuits ➢ The students can analyze, design and implement combinational logic circuits

Semester - VI				
Course Code 22BPH6E2	**DSE-2**	**T/P**	**C**	**H/W**
	RELATIVITY AND QUANTUM MECHANICS	**T**	**6**	**6**

Objectives	➢ The aim of this course is to acquire sufficient knowledge in the field of Relativity ➢ To introduce the concept of the dual nature of matter and radiation ➢ To introduce Quantum Mechanics, the Schrodinger equation and its applications and Operator formalism
Unit - I	**Relativity:-** Frames of reference – Galilean transformation – Michelson - Morley experiment – Postulates of special theory of relativity – Lorentz transformation – length Contraction – time dilation – Relativity of simultaneity – addition of velocities – variation of mass with velocity – Mass energy relation.
Unit - II	**Wave Nature of Matter:-** Dual nature of radiation and matter – De Brogile wavelength – expression of De Brogile's wave length of an electron – Phase and group velocity – Davisson and Germer's experiment – G.P.Thomson's experiment – Canonically conjugate variables – Heisenberg's uncertainty principle and its illustration.
Unit - III	**Schrodinger Equation:-** Inadequacy of classical mechanics – Basic postulates of quantum mechanics – Schrodinger equation – Properties of wave function – Probability interpretation of wave function – linear operators – self adjoint operators – expectation value – eigen values and eigen functions
Unit - IV	**Angular Momentum in Quantum Mechanics:-** Orbital angular momentum operators– commutation rules for angular momentum – Eigen value of L_z – Eigen function of L_z and L^2 – Angular momentum in general – Allowed values of total angular momentum – Elementary ideas of spin angular momentum of an electron.
Unit - V	**Solutions of Schrodinger Equation:-** Free particle solution – Particle in a box – Potential well of finite depth (one dimension) – Barrier penetration problem – linear harmonic oscillator – zero point energy - rigid rotator.

Reference and Text Books :-

Beiser A. (1997). *Concepts of modern physics* . New Delhi: 5th edition, Tata Mcgraw Hill Publishing Company.

Brijlal Subramanyam. (1990). *Mechanics and Relativity*. New Delhi: S. Chand & Company.

Chopra K.K. Agrawal G.C. (2008). *Quantum mechanics*. Meerut: First Edition(1998). Krishna Prakasam Media(P) Ltd.,

Ghatak A. Loganathan. (2008). *Quantum mechanics*. Macmillan India Pvt. Ltd.

Mathews P.M. Venkatesan S. (2005). *A Text book of Quantum mechanics* . New Delhi: Tata Mcgraw Hill Publishing Company.

Murugeshan R. Kiruthiga Sivaprasath. (2008). *Modern Physics*. New Delhi: S. Chand & Company.

Pauling and Wilson. (2005). *Introduction to quantum mechanics* ., New Delhi: Tata Mcgraw Hill Publishing Company. Thankappan V.K. (2003). *Quantum Mechanics*. New Delhi New Age International (P) Ltd. Publishers,	
Outcomes	➢ The students will be able to gain knowledge in the field of the special theory of relativity ➢ The student will understand the ideas of the dual nature of matter and radiation ➢ The students acquire knowledge in Quantum Mechanics and operator mechanism ➢ The student will be able to apply Schrödinger's equation to different problems and able to find the solution

Semester - VI				
Course Code 22BPH6E3	**DSE-3**	**T/P**	**C**	**H/W**
	NANOPHYSICS	**T**	**6**	**6**

Objectives	➢ To introduce the concept of Nano materials ➢ To understand the basics of Nanomaterials, Classification and their properties ➢ To discuss the various types of quantum materials, Nanotubes and nanostructures. ➢ To describe the applications of nanomaterials in various fields
Unit - I	**Introduction to Nanotechnology:-** History of nanotechnology – Classification of Nanomaterials – Properties of Nanomaterials – Effects of surface area to volume ratio on the properties of materials – Applications of Nanomaterials – Challenges in nanotechnology.
Unit - II	**Nanomaterials:-** Quantum dots – Quantum wires – Quantum well – Fullerenes – Buckminster fullerene – Carbon nanotubes: Properties – Synthesis: Plasma arc-discharge method – Chemical vapour deposition – Applications of carbon nanotubes. Nanocomposites – Nanohybrids – Nanoclusters and Nanoparticles.
Unit - III	**Preparation of Nanomaterials :-** Top down and bottom up approaches – Top down techniques: Ball Milling – Etching – Nanolithography. Bottom up techniques: Vacuum evaporation technique – Sputter deposition process –Hydro-thermal method – Sol-gel synthesis.
Unit - IV	**Characterization Techniques:-** X-ray Diffraction: Principle – Instrumentation – Determination of structural parameters. Scanning electron microscope (SEM) – Transmission electron microscope (TEM) – Energy Dispersive X-ray Analysis (EDAX).
Unit - V	**Applications of Nanomaterials** :- Nanoelectronics — Nanophotonics – Nanorobotics – Nano mechanics–Band gap engineered quantum devices - Photo-electrochemical cells – Gold nanoparticles in catalystis. **Biomedical applications:** Targeted drug delivery – Cancer therapy – Targeted chemotherapy – Radiation Therapy – Thermotherapy – Immunotherapy – Photodynamic therapy – Gene therapy – Tissue engineering – Biosensing.

Reference and Text Books :-

Charles P.Poole Frank J. Owens (2008). *Introduction to Nanotechnology*. India: Wiley.

Chattopadhyay K.K. Banerjee A.N.(2009). *Introduction to Nanoscience and Nanotechnology*. PHI Learning Pvt. Ltd.

Fahrner W.R. (2008). *Nanotechnology and Nanoelectronics.* (Ed.), Springer

Nanotechnology. Trichy: JAZYM Publications.

Pazhani R. Thanmozhy E. (2009). *Exploring Nanomaterials*, Pooja publishers

Ravichandran K. Swaminathan K. Praseetha P.K. Kavitha P. (2019). *Introduction of*

Outcomes	➢ The students will be able to understand the concept of nanomaterials and their advantages. ➢ The students familiarize themselves with the preparation of nanomaterials through various processes ➢ The students get an idea about SEM, TEM and EDAX

Semester - VI				
Course Code 22BPH6E4	**DSE-4**	**T/P**	**C**	**H/W**
	LASER PHYSICS AND FIBRE OPTICS	**T**	**6**	**6**

Objectives	➢ To introduce principles of LASER operation and their applications ➢ To introduce the basic concepts of optical fibre and optical fibre communication system ➢ To elaborate on the usage of LASER in Fibres
Unit - I	**Fundamentals of LASER:-** Basic Principle of LASER - Einteins coefficient – condition for light amplification – Spontaneous emission – Stimulated emission – population inversion – threshold condition. – Laser characteristics
Unit - II	**Production of LASER :-** Principle, working and energy level diagram of Helium – Neon Laser – Ruby Laser – CO_2 Laser – Semiconductor Laser
Unit - III	**Industrial Applications of LASER:-** Laser cutting – Welding – Drilling – surface hardening – Hologram – Recording and reconstruction of hologram – Lasers in Surgery – ophthalmology – cancer treatment
Unit - IV	**Optical Fibers:-** Basic structure of an optical fiber – Acceptance angle – Numerical aperture – propagation of light through an optical fiber – Theory of modes formation – Step index and graded index fibers – comparison – Losses in fibers – Dispersion in fibers
Unit - V	**Lasers in Communication:-** Optic fibre communication – Light sources – Modulation methods – Photo detectors. Block diagram of fiber optic communication system – Repeaters – Measurement of numerical aperture and optical time domain reflectors – Advantages of fiber optic communication.

Reference and Text Books :-

Avadhanulu N. (2001). *An introduction to LASERS*, New Delhi: S. Chand & Company.,

Thyagarajan K. Ghatak A.K., (1984) *LASER Theory and Application*, India : Mc Millan Ltd.

William T. Silfvast .(1998). *Laser fundamentals*, New Delhi :University Press, Published in South Asia by Foundation books.

Outcomes	➢ The students gain knowledge about LASER production ➢ The students familiarize themselves with the usage of LASER in the industry and medical field ➢ The students will be able to understand the concept of optical fibre and the transmission of data using fibres

Semester - VI				
Course Code 22BPH6PR	**DSE-5**	**T/P**	**C**	**H/W**
	PROJECT		**6**	**10**
Objective	➢ To introduce the basic idea of doing a project ➢ To increase the creativity of the students ➢ Make the students to think and enhance the depth of the subject knowledge			
	Any experimental or electronics project			
Outcomes	➢ The students will be able to get basic idea of doing project and increases his depth of subject knowledge by doing experiments			