YADAVA COLLEGE

(An Autonomous Co-Educational Institution)

Affiliated to Madurai Kamaraj University

Re-Accredited with "A" Grade by NAAC

Govindarajan Campus, Thiruppalai, Madurai- 625014

DEPARTMENT OF PHYSICS

C.B.C.S- Pattern

Post Graduate

(Effective from the academic year 2018-2019 onwards)

UNDER GRADUATE PROGRAMME IN PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

Major

Sem	*Part*	*Subject*	*Subject Code*	*Title of the Paper*	*Teach. hrs*	*Credits*	*Exam hrs*	*Marks*			
								Int	*Ext*	*Total*	*Page No*
I	I	LANG. I	P1TA1	Tamil	5	3	3	25	75	100	-
	II	LANG. II	P2EN1	English	5	3	3	25	75	100	
	III	CORE	P3CPY3	General Physics	4	5	3	25	75	100	
			P3CPY2	Thermal Physics	4	4	3	25	75	100	
				*Practical- I	3						
		ALLIED I	P3ACY1	Chemistry	3	2	3	25	75	100	
				*Practical- I	2						
	IV	ENS	P4ES	Environmental science	2	2	3	25	75	100	
		SBE	P4ECE1	Communicative English	2	2	3	25	75	100	
II	I	LANG. I	Q1TA2	Tamil	5	3	3	25	75	100	
	II	LANG. II	Q2EN2	English	5	3	3	25	75	100	
	III	CORE	Q3CPY3	Optics & Spectroscopy	4	4	3	25	75	100	
			Q3CPY4	Electromagnetism	4	4	3	25	75	100	
			Q3CPYL1	Practical- I	3	5	3	40	60	100	
		#SSP	Q3SPY2	Energy Physics	-	3	3	25	75	100	
		ALLIED I	Q3ACY2	Chemistry	3	2	3	25	75	100	
			Q3ACYL1	Practical- I	2	1	3	40	60	100	
	IV	VAE	Q4VE	Value Education	2	2	3	25	75	100	
		SBE	Q4ECE2	Communicative English	2	2	3	25	75	100	
III	I	LANG. I	R1TA3	Tamil	5	3	3	25	75	100	
	II	LANG. II	R2EN3	English	5	3	3	25	75	100	
	III	CORE	R3CPY5	Atomic Physics and Relativity	4	4	3	25	75	100	
				*Practical- II	2						
		#SSP	R3SPY3	Biophysics	-	3	3	25	75	100	
		ALLIED I	R3ACY1	Chemistry	3	2	3	25	75	100	
				*Practical- II	2						
		II	R3AMY1	Maths	5	2	3	25	75	100	
	IV	NME	R4NPY1	Physics of Sports	2	2	3	25	75	100	

		SBE	R4ECE3	Communicative English	2	2	3	25	75	100	
IV	I	LANG.I	S1TA4	Tamil	5	3	3	25	75	100	
	II	LANG.II	S2EN4	English	5	3	3	25	75	100	
	III	CORE	S3CPY6	Nuclear Physics	4	4	3	25	75	100	
			S3CPYL2	Practical-II	2	4	3	40	60	100	
		#SSP		MS office	-	3	3	25	75	100	
		ALLIED I	S3ACY1	Chemistry	3	2	3	25	75	100	
			R3ACYL2	Practical-II	2	1	3	40	60	100	
		II	S3AMY2	Maths	5	3	3	25	75	100	
	IV	NME	S4NPY2	Home Appliances	2	2	3	25	75	100	
		SBE	S4ECE4	Communicative English	2	2	3	25	75	100	
V	III	CORE		Advanced Mechanics	6	4	3	25	75	100	
			T3CPY9	Analog Electronics	6	4	3	25	75	100	
				*Practical -III	3						
				*Practical-IV	3						
		#SSP		Environmental physics	-	3	3	25	75	100	
		ELECT. I	T3EPY1	Programming in C	5	5	3	25	75	100	
			T3EPY2	Nano Science							
		ALLIED II	T3AMY3	Maths	5	2	3	25	75	100	
	IV	SBE		Soft Skills	2	2	3	25	75	100	
VI	III	CORE		Digital Electronics	4	4	3	25	75	100	
			U3CPY11	Condensed matter Physics	4	4	3	25	75	100	
			U3CPYL3	Practical-III	2	4	3	40	60	100	
			U3CPYL4	Practical-IV	4	6	3	40	60	100	
		ELECT. II		Microprocessor	5	5	3	25	75	100	
			U3EPY4	Communication Systems							
		III	U3EPY5	Astro Physics	4	5	3	25	75	100	
			U3EPYP	Project			-	20	80		
		ALLIED II	U3AMY4	Maths	5	3	3	25	75	100	
	IV	SBE		Soft Skills	2	2	3	25	75	100	
	V	NCC/NSS PE/EXT			-	1	3	25	75	100	

**Exams are conducted only at even semesters.*
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UNDER GRADUATE PROGRAMME IN PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

MAJOR

Sem	*Part*	*Subject*	*Subject Code*	*Title of the Paper*	*Teach. hrs*	*Exam hrs*	*Credits*	*Marks*			*Page No*
								Int	*Ext*	*Total*	
I	I	LANG. I	P1TA1	Tamil	5	3	3	25	75	100	-
	II	LANG. II	P2EN1	English	5	3	3	25	75	100	-
	III	CORE	P3CPY3	General Physics	4	3	5	25	75	100	1
			P3CPY2	Thermal Physics	4	3	4	25	75	100	3
				*Practical- I	3						
		ALLIED I	P3ACY1	Chemistry	3	3	2	25	75	100	-
				*Practical- I	2						
	IV	ENS	P4ES	Environmental science	2	3	2	25	75	100	-
		SBE	P4ECE1	Communicative English	2	3	2	25	75	100	-
II	I	LANG. I	Q1TA2	Tamil	5	3	3	25	75	100	-
	II	LANG. II	Q2EN2	English	5	3	3	25	75	100	-
	III	CORE	Q3CPY3	Optics & Spectroscopy	4	3	4	25	75	100	5
			Q3CPY4	Electromagnetism	4	3	4	25	75	100	7
			Q3CPYL1	Practical- I	3	3	5	40	60	100	9
		#SSP	Q3SPY2	Energy Physics	-	3	3	25	75	100	10
		ALLIED I	Q3ACY2	Chemistry	3	3	2	25	75	100	-
			Q3ACYL1	Practical- I	2	3	1	40	60	100	-
	IV	VAE	Q4VE	Value Education	2	3	2	25	75	100	-
		SBE	Q4ECE2	Communicative English	2	3	2	25	75	100	-
III	I	LANG. I	R1TA3	Tamil	5	3	3	25	75	100	-
	II	LANG. II	R2EN3	English	5	3	3	25	75	100	-
	III	CORE	R3CPY5	Atomic Physics and Relativity	4	3	4	25	75	100	11
				*Practical- II	2						
		#SSP	R3SPY3	Biophysics	-	3	3	25	75	100	13
		ALLIED I	R3ACY1		3	3	2	25	75	100	
		ALLIED II	R3AMY1		3	3	2	25	75	100	-
	IV	NME	R4NPY1	Physics of Sports	2	3	2	25	75	100	15

		SBE	R4ECE3	Communicative English	2	3	2	25	75	100	-
IV	I	LANG.I	S1TA4	Tamil	5	3	3	25	75	100	-
	II	LANG.II	S2EN4	English	5	3	3	25	75	100	-
	III	CORE	S3CPY6	Nuclear Physics	4	3	4	25	75	100	17
			S3CPYL2	Practical-II	2	3	4	40	60	100	19
		#SSP		MS office	-	3	3	25	75	100	20
		ALLIED I	S3ACY1	Chemistry	3	3	2	25	75	100	-
			R3ACYL2	Practical-II	2	3	1	40	60	100	-
		II	S3AMY2	Maths	5	3	3	25	75	100	-
	IV	NME	S4NPY2	Home Appliances	2	3	2	25	75	100	22
		SBE	S4ECE4	Communicative English	2	3	2	25	75	100	-
V	III	CORE		Advanced Mechanics	6	3	4	25	75	100	23
			T3CPY9	Analog Electronics	6	3	4	25	75	100	25
				*Practical -III	3						
				*Practical-IV	3						
		#SSP		Environmental physics	-	3	3	25	75	100	27
		ELECT. I	T3EPY1	Programming in C	5	3	5	25	75	100	29
			T3EPY2	Nano Science							31
		ALLIED II	T3AMY3	Maths	5	3	2	25	75	100	
	IV	SBE		Soft Skills	2	3	2	25	75	100	
VI	III	CORE		Digital Electronics	4	3	4	25	75	100	33
			U3CPY11	Condensed matter Physics	4	3	4	25	75	100	35
			U3CPYL3	Practical-III	2	3	4	40	60	100	37
			U3CPYL4	Practical-IV	4	3	6	40	60	100	38
		ELECT. II		Microprocessor	5	3	5	25	75	100	40
			U3EPY4	Communication Systems							42
		III	U3EPY5	Astro Physics	4	3	5	25	75	100	44
			U3EPYP	Project				20	80		-
		ALLIED II	U3AMY4	Maths	5	3	3	25	75	100	-
	IV	SBE		Soft Skills	2	3	2	25	75	100	-
	V	NCC/NSS PE/EXT			-	3	1	25	75	100	-

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DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE I - GENERAL PHYSICS			
SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
I	**P3CPY3**	**4**	**5**	**100**

Objectives

To be able to

- *understand the principles of motion of bodies and sound waves*
- *acquire knowledge about mechanics, properties of matter and gravitation*
- *appreciate the applications of conservation laws.*
- *understand the mechanism of sound waves.*

Unit I Conservation laws:

Impulse-impact –fundamental principles of impact- oblique impact of smooth sphere on a fixed smooth plane – final velocity and loss of kinetic energy in the case of direct and oblique impact of two smooth spheres –rocket motion- principle and expression for thrust and velocity –specific impulse- multistage rocket .

Unit II Motion of rigid body:

Moment of inertia – parallel and perpendicular axes theorem - moment of inertia of rectangular lamina and triangular lamina - Routh's Rule - moment of inertia of a solid sphere about all axes - compound pendulum - period of oscillation-experimental determination -torque and angular momentum – relation between them – kinetic energy of a rotating body.

Unit III Gravitation:

Kepler's law of planetary motion – law of gravitation – Boy's method for G – expression for period – experiment to find g – gravitational potential – gravitational field at a point due to spherical shell - variation of g with latitude, altitude and depth.

Unit IV Elasticity:

Elastic moduli – Poisson's ratio – relation between angle of shear and linear strain - relation between volume strain and linear strain – work done in a strain – relation between elastic moduli – Torsion of a body – static torsion – expression for couple per unit twist – work done in twisting a wire – torsional oscillations of a body – Expression for bending moment — determination of Young's modulus by uniform and non-uniform bending – I section girders —– determination of E, G and γ by Searl's method –

Unit V Sound:

Simple harmonic motion–composition of two simple harmonic vibrations of equal time periods acting at right angles - properties of longitudinal progressive waves – velocity of transverse waves along a stretched string – alternative method – laws of transverse vibration of string – verification of the laws of transverse vibration of strings –

Melde's experiment – Doppler effect - observer at rest and source in motion - source at rest and observer in motion – when both the source and the observer are in motion – ultrasonic – production of ultrasonic waves – detection of ultrasonic waves.

Textbooks:

1. *Mechanics Properties of matter and Sound; Thermal Physics, R.Murugeshan - First Edition (July 2002) – Unit I, II, III, IV*
2. *Textbook of sound by N Subrahmanyam Brijlal, Second Revised Edition, Reprint (2004), Vikas Publishing House PVT Ltd*
   Unit V - 1.3, 2.4, 4.8, 7.1 to 7.5, 8.1 to 8.4, 10.23 to10.25.

Reference book:

1. *Properties of matter by Brijlal N. Subramanian, Reprint 2004, S. Chand &Co. Ltd.,*
2. *Elements of Properties of matter by D.S. Mathur S.chand &Co.,New Delhi.*
3. *University physics by Sears Zemansky and young 6th Edition, Naresa publishing house, chennai.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE II - THERMAL PHYSICS			
SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
I	**P3CPY2**	**4**	**4**	**100**

Objectives

To be able to

- *understand the different methods of heat transfer*
- *appreciate the applications of kinetic theory of gases*
- *recall the laws of thermodynamics*
- *review the concepts of entropy*

Unit I Calorimetry:

Definitions-Regnault's method of mixtures-copper block calorimeter-Nernst vacuum calorimeter-Newton's Law of cooling- specific heat of a liquid-Joule's electrical Method – two specific heat capacities of a gas-Joly's differential steam calorimeter – Regnault's Method – continuous flow electrical method

Unit II Transmission of Heat:

Introduction-coefficient of thermal conductivity-Lee's method for bad conductors-spherical shell method-cylindrical flow of heat-thermal conductivity of rubber- -Wiedemann-Franz law-convection-applications of convection-convective equilibrium of the atmosphere-properties of thermal radiations- applications of heat radiations-Stefan's law-mathematical derivation of Stefan's law-derivation of Newton's law of cooling from Stefan's law –experimental verification of Stefan's law –determination of Stefan's constant(lab method)-solar constant-temperature of the sun

Unit III Kinetic theory of gases:

Expression for the pressure of a gas-kinetic energy per unit volume of a gas-kinetic interpretation of temperature-derivation of gas equation-derivation of gas laws-Avagadro's hypothesis-degrees of freedom and Maxwell's law of equipartition of energy-atomicity of gases-Maxwell's law of distribution of velocity-experimental verification of velocity distribution – mean free path- transport phenomena-viscosity of gases-thermal conductivity of gases-Vanderwaal's equation of state- critical constants-critical coefficient-Joule-Kelvin effect-temperature of inversion

Unit IV T**hermodynamics:**

First law of thermodynamics-first law of thermodynamics for a change in state of a closed system-Isothermal - adiabatic -isobaric – isochoric processes - Gas equation during adiabatic process-slopes of adiabatic and isothermals-work done during an isothermal process-work done during an adiabatic process-relation between adiabatic and isothermal elasticities-Clement and Desorme's method-determination of γ-Second law of thermodynamics-Carnot's reversible engine-Carnot's engine and refrigerator-Carnot's theorem

Unit V Entropy:

Change in entropy in a reversible process-change in entropy in an irreversible process-third law of thermodynamics-temperature entropy diagram-entropy of a perfect gas-zero point energy-negative temperature-Maxwell's thermodynamical relation-Helmholtz function-thermodynamic potential or Gibb's function

Text Book:

Heat and Thermodynamics by Brijlal and Subrahmanyam, 15th Edition, Reprint (1993), S Chand &Company

Unit I – 3.1-3.6, 3.10 -3.13

Unit II – 8.1, 8.2,8.8,8.11-8.13,8.17,8.20,8.21,8.24,8.27,8.28,8.35,8.36-8.38,8.43,8.44

Unit III – 5.13-5.19, 5.21-5.28, 5.36-5.37,5.39, 5.46

Unit IV – 6.8, 6.9, 6.11 to 6.20, 6.25-6.28

Unit V – 6 .44-6.54

Reference book:

'*University physics', Sears Zemansky* and *Young, 6th Edition, Narosa publishing house, Chennai.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE III - OPTICS AND SPECTROSCOPY			
SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
II	**Q3CPY3**	**4**	**4**	**100**

Objectives

To be able to

- *understand the concepts of dispersion and aberration.*
- *know the phenomenon of interference, diffraction and polarisation.*
- *identify the applications of laser.*
- *gain knowledge about various spectroscopy.*

Unit I Geometrical Optics:

Dispersion through a prism – Cauchy`s Formula – achromatism in prisms – deviation without dispersion – dispersion without deviation – direct vision spectroscope. aberration in lenses: Introduction – spherical aberration in lenses – methods of minimizing spherical aberrations – condition for minimum spherical aberration of two thin lenses separated by a distance – eyepieces – Huygen's eyepiece – Ramsden's eyepiece – comparison of eyepieces.

Unit II Interference:

Introduction – theory of interference fringes- colors of thin films –production of colors in thin films – wedge shaped film – Newton rings – determination of wavelength of sodium light by Newton's rings – determination of refractive index of a liquid by Newton's rings – Michelson's Interferometer – uses of Michelsons Interferometer-Jamin's Interferometer.

Unit III Diffraction:

Introduction – Fresnel`s explanation of rectilinear propagation of light – plane transmission diffraction grating – absent spectra with a diffraction grating –dispersive power of a grating – determination of wavelength of light using transmission grating (normal incidence) – resolving power of optical instruments – resolving power of a telescope – relation between magnifying power and resolving power of a telescope – resolving power of microscope-resolving power of a prism – resolving power of a plane diffraction grating- comparison of prism and grating spectra.

Unit IV Polarisation:

Introduction – Polarisation by reflection- pile of plates –law of Malus – double refraction – Huygen's theory of double refraction in uniaxial crystals – Huygen's construction for double refraction in uniaxial crystals – Nicol prism-plane, circularly and elliptically polarized light – theory of production of elliptically and circularly polarized light – quarter wave plate – half wave plate-production and detection of plane, circularly and elliptically

polarized light – specific rotation – Laurent's half shade polarimeter – determination of specific rotation of sugar solution.

Unit V Spectroscopy:

Introduction – Infrared spectroscopy –ultraviolet Spectroscopy – Rayleigh scattering – Raman effect – experimental study of Raman effect – quantum theory of Raman effect – applications – lasers: Induced absorption, spontaneous emission, stimulated emission, Ruby laser – Helium neon laser – semiconductor laser, properties of laser beam.

Text Book:

Optics and Spectroscopy by R. Murugeshan, Second Edition 1998, S.Chand & Company Ltd.,

Unit I –1.7 to 1.11,1.15 to 1.18,1.25 to 1.28

Unit II – 2.1,2.2,2.5 to 2.13

Unit III – 3.1,3.2,3.12 to 3.14,3.17,3.19 to 3.25

Unit IV – 4 .1 to 4.8,4.10 to 4.14,4.19 to 4.21

Unit V – 5.1 to 5.8,5.13 to 5.17

Reference Books:

1. A Text Book of Optics by N.Subrahmnanyam, Brijlal, M.N. Avadhanulu, First Multicolor Edition (2006), S.Chand & Company Ltd.,

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE IV - ELECTROMAGNETISM				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q3CPY4**	**4**	**4**	**100**

Objectives

To be able to

- *understand the concepts of magnetic effects of current*
- *rejuvenate the magnetic properties of material*
- *recall the laws of electromagnetic induction*
- *understand the effects of alternating currents*

Unit I Magnetic effects of currents:

Biot Savart law – Magnetic Induction at a point due to a straight conductor – Circular coil-solenoid – Definition of B – Lorenz force- Force on current and between two parallel currents – Torque – Moving coil B.G – Damping correction – Measurements of figure of merit – Absolute capacity of capacitor – Comparision of capacitances and emf's.

Unit II Electromagnetic induction and transient currents:

Faraday's law – lens law – self-induction – Rayleigh's method – Anderson bridge-mutual induction – experimental determination of growth and decay of current – containing L and R - growth and decay of charge of a capacitor through R – measurement of high resistance by leakage.

Unit III Magnetic properties of material:

Magnetic induction-Magnetization-Relation between three magnetic vectors – Susceptibility – Determination of susceptibility – Permeability – Properties of dia, Para, Ferro – Electron theory – Langevin's theory and diamagnetism, Para magnetism – Weiss's theory of ferromagnetism.

Unit IV Electrical Measurements:

Carey foster bridge – Theory and experiment to find temperature coefficient and specific resistance – Potentiometer– Calibration of ammeter and voltmeter – Measurement of thermo emf.

Unit V Alternating current:

Emf induced in a coil rotating in a magnetic field – Mean value – Root mean square value – Form factor – Series LCR circuit – Resonance – Q factor – Parallel resonance circuit – Power – Wattless current – Chock coil – Transformer – Skin effect.

Textbook:

Electricity and Magnetism by R. Murugeshan, 1999 Edition, Chand & Company Ltd.
Unit I –Chapter – 10.1 to10.4, 10.6 to 10.8,10.10,10.11, & 10.13 to 10.16
Unit II – Chapter – 11.1, 11.3,11.5 to 11.7 & 11.9, Chapter – 12.1 to 12.4.
Unit III – Chapter – 15.1 to 15.8, 15.10 to 15.13 & 15.18.
Unit IV – Chapter – 7.1,7.2, Chapter – 8.3,
Unit V – Chapter – 13.1 to 13.8.

Reference books:

1. *Electricity and Magnetism by Brijlal N. Subramanityam – First Edition (1964), 20thRevised edition (1994), Ratan Prakashan Mandir Educational & University Publishers.*
2. *Electricity and Magnetism by Sehgal Chopra Sehgal,Reprint(2002), Sultan chand & sons company Ltd.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE V - PRACTICAL I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q3CPYL1**	**3**	**5**	**100**

ANY FIFTEEN EXPERIMENTS

1. Estimation of Errors
2. Young's Modulus – uniform bending – Pin and Microscopic method
3. Young's Modulus – uniform bending – Optic lever method
4. Young's Modulus – non-uniform bending - Pin and Microscopic method.
5. Young's Modulus – non uniform bending – Optic lever method
6. q, n, σ - Searle's apparatus
7. Torsional Oscillations –Rigidity Modulus and Moment of Inertia.
8. Compound Pendulum – g and k
9. Spectrometer – Dispersive power of prism
10. Spectrometer – Grating minimum deviation
11. Potentiometer – Calibration Low range Voltmeter
12. Melde's string – Frequency of tuning fork
13. Potentiometer – Ammeter calibration
14. Potentiometer –Resistance & Resistivity of a wire
15. Lee's disc – Thermal Conductivity of a cardboard
16. Stoke's method – Coefficient of viscosity of a liquid
17. Sonometer – Laws verification

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER I - ENERGY PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q3SPY2**		**3**	**100**

Objectives

To be able to

- *understand various energy sources.*
- *understand the concept of solar energy.*
- *understand conversion of light energy into electrical energy.*
- *understand uses of solar equipments.*

Unit I

World's resrve of commercial energy sources and their availability – Various forms of energy – Renewable and conventional energy systems – Comparision.

Unit II

Renewable energy sources – Solar energy – Nature of solar radiation – Components– Solar heaters – Crop dryers – Space cooling.

Unit III

Solar ponds – Solar cookers – Water desalination – Photovoltaic generation basis – Merits and demerits of solar energy.

Unit I V

Conservation of energy – Patterns of energy consumption in domestic, Industrial, transportation and agricultural sectors – Conservation principles in these sectors.

Unit V

Energy crisis and possible solutions – Energy options for the developing countries – Energy storage and hydrogen as a fuel (basics) – impacts due to non-conventional energy sources – global warming.

Reference Books:

1. Solar energy utilization by G.D. Rai, Ed.V.1995.
2. Non conventional energy sources by G.D. Rai, Ed.IV.1997
3. Solar energy by S.P.Sukhatme, Tata McGraw Hill publishing Company, Ed.II.1997
4. Energy technology by S.Rao and Dr.B.B.Parulekar, Ed.II.1997

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VI - ATOMIC PHYSICS AND RELATIVITY				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R3CPY5**	**4**	**4**	**100**

Objectives

To be able to

- *understand the theory of relativity*
- *trace the structure of atoms from classical model*
- *rejuvenate the magnetic moment by experiments*
- *gain the Knowledge of the x-rays*

Unit I Theory of Relativity

Introduction-Frame of Reference-Newtonian Relativity-Galilean Transformation Equations-The Ether Hypothesis – The Michelson-Morley Experiment-Special theory of relativity – The Lorentz Transformation Equations- Length Contraction – Time Dilation – Addition of Velocities – Variation of Mass with Velocity – Mass Energy Equivalence.

Unit II The Free Electron theory of metals

Electrical conduction in metals- Expression for electrical conductivity – Expression for thermal Conductivity .

Positive Rays Discovery – Properties of Positive Rays – Positive Ray Analysis – Thomson's Parabola method – Aston's Mass Spectrograph – Bainbridge's Mass Spectrograph

Unit III Structure of the Atom

Bohr Atom Model – Critic potentials – Atomic Excitation – Experimental determination of critical potentials – Sommerfield's relativistic atom model – The vector atom model- Quantum numbers associated with the vector atom model –Coupling schemes.

Unit IV

The Pauli exclusion principle – The periodic classification of elements – Some examples of electron configuration with their modern symbolic representations – Magnetic dipole moment due to orbital motion of the electron – Magnetic dipole

moment due to spin – The Stern and Gerlach experiment – Optical spectra – Zeeman effect

Unit V X-rays

Production of X-rays – Bragg's law – The bragg x-ray spectrometer – The powder crystal method – Simple crystal structures – X-ray spectrum – Characteristic of X-ray spectrum – Mosely's law – Compton scattering.

Text Book:

Modern Physics, R. Murugeshan – S. Chand & Company LTD, Sixth Revised Edition (1998)

Unit I – Chapter 1.1 to 1.10, 1.12 to 1.14

Unit II – Chapter 2.7 to2.9, 3.1to 3.5.

Unit III – Chapter 4.4, 4.8 to 4.14

Unit IV – Chapter 4.15 to 4.20, 4.22, 4.23

Unit V – Chapter 5.2, 5.6 to 5.8, 5.10 to 5.14.

Reference Books:

1. Modern physics – Arther Beiser

2. Modern physics – Seghal, Chopra and Seghal.

3. Nuclear physics – I. Kaplan

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER II - BIO – PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R3SPY3**		**3**	**100**

Objectives

To be able to

- *understand Bio molecules and types of bonds in biological molecules.*
- *understand principles of optics in biological studies.*
- *understand various types of spectroscopy used to study the biological molecules.*

Unit I: Bio molecules

Introduction – Organization of molecules – macro molecules and inter molecular forces – Stability of macro molecules – Types of bonds in biological molecules.

Unit II: Principles of kinetics of molecules

Diffusion- factors of affecting diffusion – Simple diffusion – Fick's law of diffusion – diffusion of electrolytes – Osmosis – Osmotic pressure – Laws of Osmosis – Determination of Osmotic pressure – Dialysis – Principle of dialysis in artificial kidney – kinds of dialysis.

Unit III: Principles of optics in Biological studies

Characteristic of light – Microscopy – Types of microscopes – Compound microscope – Electron microscope – Transmission electron microscope (TEM) – Scanning electron microscope (SEM) – Scanning tunneling electron microscope (STEM).

Unit IV: Bio physical phenomena in Bio chemical studies

Hydrogen ion concentration (PH) – PH scale – determination of PH – PH meter – factors affecting measurements of PH – centrifugation – basic principles of centrifugation – centrifuge.

Unit V: Spectroscopy in biological studies

Spectroscopy – Raman spectroscopy – X-ray diffraction spectroscopy – rotating crystal diffraction spectrometer – powder crystal diffraction spectrometer – NMR spectroscopy – ESR spectroscopy.

Text Book:

1. Bio-Physics principles and techniques – M.A Subramanian, MJP publishers, 2005,

Reference Books:

1. Bio-Physics, Mohan P.Arora, First edition (2004), Himalaya Publishing house.
2. Bio-Physics, Vasantha pattabhi, N.Gautham, Reprint 2005, Narosa publishing House.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	Non-Major Elective I - PHYSICS OF SPORTS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R4NPY1**	**2**	**3**	**100**

Objectives

To be able to

- *understand physics behind sports activities*
- *gain knowledge about torque, impulse and momentum*
- *know about projectile motion*

Unit I: Energy

Need for energy – Energy for Internal body process – energy for growth – energy for activity – energy for utilization of food – Physics Principles – Distance – Displacement – Speed – Acceleration – inertia – Mass – Momentum– Energy – Kinetic Energy and Potential Energy

Unit II: Force and Gravity

Force – Example of force – Friction – Torque – Center of gravity – Acceleration due to gravity – Balance of stability – Tasks requiring instability – Use of gravity – Increasing stability while in motion – Controlling momentum – Potential energy of athletics

Unit III: Conservation of Laws

Impulse – Principle of conservation of momentum – elasticity – Newton's law of impact – Direct impact – oblique impact – conservation of total energy – momentum and use of the body

Unit IV: Angular Momentum

Angular displacement – angular velocity – Angular acceleration – Centripetal force – Centrifugal force – Moment of inertia – Angular momentum – elastic and inelastic collisions – Projectiles.

Unit V: Projectile Motion

Projectiles in sports – propelling force – friction – sliding and rolling friction – spin friction - force of gravity – effects of air resistance – angle and height of projection – angle of projection – shot-put and long jump – horizontal motion – rebound – striking force – effects of spin

Reference:

‘Physics of sports’ by Department of Physics, Yadava College, Madurai-14

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VII - NUCLEAR PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**modified**	**4**	**4**	**100**

Objectives

To be able to

- *trace the structure of nucleus from various models*
- *revive the concept of radioactivity*
- *gather information about universe*
- *gain the Knowledge of the elementary particles*

Unit I Introduction to the Nucleus

Introduction – Classification of Nuclei – General properties of Nucleus – Binding Energy – Nuclear stability – Theories of nuclear composition – Nuclear forces – Meson theory of nuclear forces – Models of nuclear structure – The liquid drop model – The Shell model .

Unit II Detectors of nuclear radiations

Ionization chamber – Geiger Muller counter – Wilson cloud chamber – diffusion cloud chamber – bubble chamber – The cyclotron – The synchrocyclotron -The betatron – The synchrotrons –The proton synchrotron

Unit III Radioactivity

Discovery of radioactivity – Natural radioactivity – alpha, beta and gamma rays – properties of alpha rays – properties of beta rays – properties of gamma rays – determination of e/m of alpha particles – Experiments to find range of alpha particles – alpha particle disintegration — nature of beta particles – determination of e/m of beta particles: Kaufmann's experiment

Gamma ray spectra : Introduction – Determination of wavelength of gamma rays – origin of gamma rays - Soddy Fajans displacement law – Law of radioactive disintegrations – The mean life – Measurement of decay constants – Units of radioactivity – law of successive disintegration – radioactive dating – Biological effects of nuclear radiations

Unit IV Nuclear Fission, Fusion and cosmic rays:

Discovery – Nuclear fission – Energy released in fission – Chain reaction – Atom bomb – Nuclear reactors – Nuclear fusion – Source of stellar energy – thermonuclear reactions

Cosmic rays: Discovery of Cosmic rays – Latitude effect – The east west effect –Altitude effect – primary cosmic rays – secondary cosmic rays – cosmic ray showers.

Unit V The Universe and elementary particles:

The Big-bang theory- thermal history of the universe – Hubble's law - The future of the universe – Dark matter

Elementary particles : Introduction – Particles and Anti particles – antimatter – the fundamental interactions – elementary particle quantum numbers – conservation law and symmetry – the quark model .

Text Book:

Modern Physics, Murugeshan – S. Chand & Company LTD, Sixth Edition (1998) & Thirteenth (Revised) colour Edition (2007).

Unit I – Chapter 8.1 to 8.11

Unit II – Chapter 9.3, 9.6 to 9.9, 10.4, 10.6 to 10.9

Unit III – Chapter 11.1 to 11.7, 11.10, 11.14, 11.16 11.17, 11.23 to 11.25, 11.28, 11.30 to 11.36

Unit IV – Chapter 13.1 to13.9, 14.1 to 14.4, 14.8, 14.9, 14.12.

Unit V– Chapter 37.12 to 37.16, 38.1 to 38.7.

Reference Books:

1. Modern physics – Arther Beiser

2. Modern physics – Seghal, Chopra and Seghal.

3. Nuclear physics – I. Kaplan

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VIII- PRACTICAL II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S3CPYL2**	**2**	**4**	**100**

ANY FIFTEEN EXPERIMENTS

1. Sonometer – AC frequency
2. Copper voltameter – ECE of copper
3. Air wedge – Thickness of paper
4. Newton's rings - Radius of curvature of lens
5. LCR – Series
6. Spectrometer – Prism i-d curve - Refractive index of prism
7. Spectrometer – Prism i-i' curve - Refractive index of prism
8. Spectrometer- Grating – Normal Incidence.
9. Spectrometer- Grating – Resolving power and Dispersive power
10. B.G –Voltage and current sensitivity.
11. B. G – Charge sensitivity
12. B.G – Comparison of emf.
13. LCR – Parallel
14. Carey faster's Bridge – unknown Resistance
15. B.G – Comparison of capacitances.
16. AC bridges – Desauty's bridge
17. AC bridges – Owen's bridge
18. Impedance and Power factor - LR circuit

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER III - MS-OFFICE				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV			**3**	**100**

Objectives

To be able to

- *understand MS office word*
- *gain knowledge about Excel basics*
- *develop skills in power point*

UNIT-I MS Office 2007

Microsoft office word 2007-Microsoft office outlook-Microsoft office excel-Microsoft office power point-Microsoft office one note-Microsoft office access-Microsoft office publisher-Microsoft office vision-Microsoft office project-Microsoft share point designer.

UNIT-II Word Basics I

Introduction-Starting wood-Creating documents-Part of word window-Mouse operation-Keyboard operations-Kinds of keys-Individual key-Things to avoid.

UNIT-III Word Basics II

Ms word menus in focus-File menu-Edit menu-view menu-insert menu-Format menu-Tools menu-Table menu-window menu-Help menu.

UNIT-IV Excel Basics

Introduction-Navigation-Selection cells-selecting cells with the mouse-Entering and Editing text-Entering numbers-Entering formulas-Entering dates-Some Do's and Don'ts-Ms excel menus-File menu-Edit menu-view menu-Insert menu-Format menu-Tools menu-Data menu-window menu-Help menu.

UNIT-V PowerPoint Basics

Introduction-Creating a new presentation-Opening a presentation-Creating a new slide-Deleting a presentation-Creating a new slide-Deleting a slide-Copying a slide-Numbering the slides-Saving a presentation-Closing a presentation-Saving a presentation with a different name-Changing default directory-Auto save-Printing a presentation-Ms

power point menus in focus-File menu-Edit menu-View menu-Insert menu-Format menu-Tools menu-Slide Show menu-Window menu-Help menu.

Text Book:

1. *MS office XP for everyone by Sanjay Saxena, Vikas publishing Housepvt.ltd,2007.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	Non-Major Elective II – BASICS OF COMPUTER HOME APPLIANCES				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S4NPY2**	**2**	**2**	**100**

Objectives

To be able to

- *understand the concept of physics in home appliances*
- *understand the application communication*
- *appreciate the application of digital and micro appliances*

Unit I: Parts of Computer

Parts of a computer – working of computer keyboard and mouse – working of magnetic storage and printer – analog data digitization

Unit II: Types of Computers

Types of computer – super computer – neuro computer – pocket computer – bar codes

Unit III: Communication based appliances

Working of telephone – teleconferencing – text and photos sent by phone – electronic mail

Unit IV: Digital appliances

Digital recording – Lasers and holography – computer hardware and software

Unit V: Micro appliances

The microphone and tape recording – radio wave and ionosphere and working of Radio – incandescent lamp – fluorescent lamp – refrigerator – microwave oven – coffee maker – hair dryer

Reference:

1. '*Home Appliances'* by *Department of Physics, Yadava College, Madurai-14*
2. *www.wikipedia.com*
3. *www.howstuffworks.com*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE IX - ADVANCED MECHANICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	V		**6**	**4**	**100**

Objectives

To be able to

- *understand the concept of wave mechanics*
- *understand the application and concept of Ensembles*
- *appreciate the application of Classical and Quantum statistics*
- *understand Quantum concepts*

Unit I – Classical Mechanics

Conservative forces – Conservation Theorem for Energy – Degrees of Freedom – Constraints - Generalized Coordinates- D'Alembert's Principle – The Lagrangian function- Derivation of Lagrange's equation of Motion-Simple applications of the Lagrangian equations- Hamiltonian Function H –Hamilton's Canonical equations of motion – Derivation of Hamilton's Canonical Equations of motion - The two-body central force problem - The Kepler problem

Unit II – Wave Mechanics I

Introduction - Expression for Group Velocity - Experimental study of matter waves – Heisenberg's uncertainty Principle – Wave Mechanical Atom model – Mathematical Proof of Uncertainty principle - One-Dimensional wave packet

Unit III - Wave Mechanics II

Basic postulates of wave mechanics - Derivation of Time-dependent form of Schrodinger equation - Properties of the wave function - The particle in a box - Potential Step – The Barrier Penetration problem

Unit IV – Statistical Mechanics

Introduction – Phase Space - Maxwell Boltzmann distribution law - Molecular energies in an ideal gas - Bose Einstein distribution law - Fermi-Dirac distribution law -

Comparison of the three distribution laws – Black Body Radiation – Rayleigh-Jeans Formula – Planck Radiation Formula – Wien's Displacement Law – Stefan Boltzmann Law from Planck's formula – Application of Fermi-Dirac distribution to White Dwarfs and Neutron Stars.

Unit V – Quantum Mechanics

Postulates of Quantum Mechanics – Probability Current Density – The Free Particle – Rectangular Potential Well – The Square Well in Three Dimensions – Erhenfest's Theorem

Text Books

1. *Modern Physics by R. Murugeshan, S. Chand & Company LTD, Sixth Edition 1998 & Thirteenth (Revised) Edition (2007)*

Unit I - 18.1 to 18.14

Unit II –11.1 to 11.6

Unit III –11.7 to 11.12

Unit IV -75.1 to 75.13

Unit V– 12.1 to 12.6

Reference Book

1. *Text Book of Mechanics by B. N. Bhargava and G. S. Sharma*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE X- ANALOG ELECTRONICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	V	**T3CPY9**	**6**	**4**	**100**

Objectives

To be able to

- *gain knowledge of Electronics*
- *solve the linear circuits*
- *develop skills about the all electronic devices*
- *gain knowledge about latest application in Electronics*

Unit I

Semiconductor Physics: Semiconductor - Energy band description of semiconductors – Effect of temperature on semiconductors – Carrier Concentrations (Intrinsic and Extrinsic) – p and n type semiconductors – pn - junction – Properties of pn – junction - VI characteristics of a pn – junction.

Semiconductor diode – Crystal diode as a rectifier – Resistance of crystal diode – Equivalent circuit of crystal diode – Crystal diode equivalent circuits – Zener diode – Equivalent circuit of Zener diode – Zener diode as voltage stabilizer.

Unit II

Transistors: Transistor – Naming the transistor terminals – Transistor action – Transistor symbols – Transistor as an amplifier – Transistor connections.

Faithful amplification – Stabilization – Essentials of a transistor biasing circuit – Methods of transistor biasing – Base resistor method – Biasing with feedback resistor – Voltage divider bias method

Unit III

Single Stage Transistor Amplifiers: Single stage transistor amplifiers – Graphical demonstration of transistor amplifier – Practical circuit of transistor amplifier – Phase reversal – D.C and A.C equivalent circuits – Load line analysis – A.C emitter resistance – Formula for A.C emitter resistance – Voltage gain in terms of A.C emitter resistance.

Unit IV

Multistage transistor amplifiers: Multistage transistor amplifier – Important terms – RC coupled transistor amplifier – Transformer coupled amplifier – Direct coupled amplifier – Comparison of different types of coupling – Power amplifiers – Difference between the voltage and power amplifiers – Classification of power amplifiers.

Unit V

Amplifiers with negative feedback: Feedback – Principles of voltage feedback in amplifiers – Positive feedback amplifiers – Barkhausen criterion – Oscillator - Different types of transistor oscillators – Colpitt's oscillator – Hartley oscillator – Principles of phase shift oscillators.

Text book:

Principles of Electronics –V.K.Mehta, S. Chand & Company, 2005

Reference books

1. Integrated Electronics - Millman & Hallikas

2. Electronic Principles - Malvino

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER IV ENVIRONMENTAL PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	V			**3**	**100**

Objectives

To be able to

- *understand and identify various sources of energy*
- *learn to conserve energy resources*
- *protect environment through Physical Principles*
- *explore additional resources*

Unit- I

Momentum and Inertia – Forces – Action and reaction – Motion – Friction and air resistance – Gravity – Landslides and slope stability –The Coriolis force – Cyclone separators for air pollution control – Seismic waves

Unit II

Renewable energy – Renewable sources – Hydroelectric power and potential energy – Wind power – Tides and Tidal power – Energy in waves and wave power – Photovoltaics – Give me sunshine – Energy storage – Other biological energy sources – Biomass energy – How much energy in a day's human labour.

Unit-III

Bernoulli's principle – Aerodynamics and aerofoils – Bird flight – Atmospheric transport of pollutants – Surface tension and surface effects –Hydrology and hydrogeology – Hydrological processes – Darcy's law – Ground water flow – Contaminant transport in ground water

Unit-IV

The Earth's climate – The atmosphere – Weather disturbances – Ocean currents – EI Nino – The Ozone layer – Climate change – The Earth's radiative balance, albedo and the Green's house effect – Global warming on the back of an envelope – Greenhouse gases and Greenhouse warming potentials – Greenhouse warming, feed backs and climate impacts

Unit V

Types of ionising radiation– Units of radiation measurement – Carbon dating and other radiometric dating techniques – Palaeoecology and peat box – Biological impacts of ionizing radiation – Radiation doses and dose limits – Risk analyses – Radon gas in homes – Nuclear safety and nuclear incident's – Lessons from Chernobyl – Radioactive discharges – Nuclear waste

Text Book:

Environmental Physics by Clares Smith, Second Indian Reprint, 2012

Unit I - Chapter 1
Unit II - Chapter 2
Unit III - Chapter 4
Unit IV - Chapter 5
Unit V - Chapter 7

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER I - PROGRAMMING IN C				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	V	**T3EPY1**	**5**	**5**	**100**

Objectives

To be able to

- *understand the concepts of Operators*
- *understand the usage I/O functions*
- *develop skill in arrays, pointers, union and structure*
- *develop tricks to solve a given problem using C*

Unit I Introduction to C

Introduction to C – Character Set – C token – C identifiers – Key words – Constants – Data types – Variables – Float – Character – Void – The constant key word.

Unit II Operators

Assignment operator – Arithmetic operators – Relational operators – Logical operators – Auto increment/decrement operators – Ternary operators – Cast operator – Bit wise operators – Bit wise shift operators – Special operators – Expressions – Type conversion in expression.

Unit III Input/Output operations and control statements

Input data – Scanf function – Scanf features – Output ( ) operations – Printf ( ) function – First program in C – IF statement – Simple if statement – Simple if-else statement – Block if statement – Block if-else statement – Nested ifs – Looping – FOR loop – Looping using while – Looping using do-while – Comparative study of loop – Break statement – Continuous statement – Exit function – Switch statement – Go To statement.

Unit IV Arrays and User defined function

One dimensional array – Array initialization –Searching – Two dimensional array Initialization of two dimensional arrays – Two dimensional sorting – Multidimensional arrays – What is a C function – Return statement – Calling a function – Category of functions.

Unit V Pointers, Structure and Unions

What is a pointer – Pointer operators – How to access a variable through its pointer – Pointer expressions – Call by value – Call by reference – Pointers in arithmetic operations.

What is a structure? – Giving values to structure elements – Structure initialization – Arrays of structures – Comparision of structure variables – Structures and pointers – unions.

Text Book

Programming in C – Dr. S. Ramaswamy P.Radhaganesan, Second Edition, June 2006, Scitech Publications (India) Pvt. ltd.

Unit I – Chapter 2 – 2.1 to 2.11.

Unit II – Chapter 2 – 2.12 to 2.24.

Unit III – Chapter 3, 4 – 3.1 to 3.6, 4.1 to 4.16.

Unit IV – Chapter 5, 6 – 5.1 to 5.7, 6.1 to 6.4.

Unit V – Chapter 8, 10 – 8.1 to 8.7, 10.1 to 10.5, 10.9, 10.10.

Reference Book

1. *Programming in C – E. Balagurusamy, Tata McGraw – Hill Publishing Company Limited, New Delhi, Third Edition (2004).*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER II - NANO SCIENCE				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	V	**T3EPY2**	**5**	**5**	**100**

Objectives

To be able to

- *understand the term "NANO'*
- *gain knowledge about Q-dots*
- *rejuvenate synthesis techniches*
- *understand applications of nano in various fields*

Unit I Investigating and manipulating materials in the Nanoscale

Introduction-Electron Microscopy-Scanning Probe Microscopy-Optical Microscopies for Nanoscience and Technology – Other kinds of microscopies – X-Ray Diffraction.

Unit II Semiconductor Quantum dots

Introduction-Synthesis of quantum dots-Electronic structure of nanocrystals-How do we study quantum dots?-Correlation of properties with size-uses

Unit III Monolayer-protected Metal Nanoparticels

Introduction – Method of Preparation – Characterization – Functionalized Metal Nanoparticles – Applications – Superlattices

Unit IV Core-Shell Nanoparticles

Introduction – Types of systems – Characterization – properties – applications

Unit V Nanoshells

Introduction –Types of Nanoshells- properties – Characterization – Applications

Text Book:
NANO : The Essentials by T. Pradeep, TATA McGraw-Hill Publishing Company, First Reprint 2008.
Unit I: chapter 2 – 2.1 to 2.6
Unit II: Chapter 7 – 7.1 to 7.5
Unit III: Chapter 8- 8.1 to 8.6
Unit IV: Chapter 9-9.1 to 9.5
Unit V: Chapter 10- 10.1 to 10.5

Reference Book:
Nanocrystalline Materials by A.I. Gusev, A.A. Rampel, First Indian Edition 2008, Cambridge International Science Publishing

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XI - DIGITAL ELECTRONICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI		**4**	**4**	**100**

Objectives

To be able to

- *understand binary codes and Boolean algebra.*
- *design simple arithmetic circuits.*
- *understand and design simple logic circuits.*
- *understand counter technique and design simple counters*

Unit I Number System, Binary Arithmetic and codes

Binary System – Hexadecimal System – Octal system– conversions.

Binary: Addition, subtraction, Multiplication, & Division – 1's and 2's Complements

BCD Codes-8421 codes – Excess-3 code – Gray Code – 2421 and 4221 codes – ASCII Code.

Unit II Logic and Arithmetic Circuits

Basic Logic Gates NOT, OR, AND – Logic Circuits and Logic Expressions – Sum of Products (SOP) – Product of sum (POS) – NAND and NOR gates – Ex-OR and Ex-NOR gates.

Binary Addition – Half Adder and Full Adder – Four bit binary Adder – BCD adder – Half subtractor and Full subtractor – Four bit adder/subtractor circuit.

Unit III Boolean algebra - Logic Gates - Karnaugh Map:

Laws of Boolean algebra – DE Morgan's Theorems – NAND as Universal gate – NAND-NAND network – NOR as Universal gate – NOR-NOR network – NOR to OR gate network – NAND to AND gate network – Minterms and Maxterms – Relationship between K map and truth table – 2,3,4 variable K map using minterms.

Unit IV Combination Circuits and Flip-flops:

Multiplexer – Demultiplexer – Decoder – Encoder - Introduction – NAND Latch – SR Flip-flop – D Flip-flop – JK Flip-flop – T Flip-flop.

Unit V Registers and Counters:

Registers – Shift register – Ring counter – Shift Counter / Johnson's Counter – Asynchronous Counters – Synchronous Counters – Design of Synchronous Counters.

Text Books;

Digital Fundamentals – V.Vijayendran (2007).

Unit I – Chapter 1.2 to 1.14, 2.1-2.5, 3.1-3.5

Unit II – Chapter 4.3 to 4.8 and 8.1 to 8.6

Unit III – Chapter 5.1 to 5.8 and 6.1to 6.5

Unit IV – Chapter 9.1 to 9.4 & 10.1 to 10.6

Unit V – Chapter 11.1 to 11.7

Reference Books

1. Digital Principles and Application by Malvino Leach, TATA Mc Graw Hill, Fifth edition, (2005).

2. Digital electronics – William H. Gothmann, Second edition.

3. Digital electronics – V.K.Puri

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XII - CONDENSED MATTER PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI	**U3CPY11**	**4**	**4**	**100**

Objectives

To be able to

- *have an introductory idea of crystal and crystal structure*
- *understand the concepts of energy and bonding in solids*
- *have an idea of super conductors*
- *understand the concepts of defects in solids*

Unit I Crystal Structure:

Introduction – Basic concepts of crystallography: crystals and single crystals – Lattice points and space lattice – Basis – Unit cell – Bravais lattice – crystal planes and miller indices: Procedure for finding miller indices – important features of miller indices – Crystal structures: Sc, Bcc, FCC and HCP structure – Important crystal structure: Nacl and Diamond structure

Unit II Diffraction of X – rays by crystals:

Introduction – Bragg's law – Experimental methods in X – Ray diffraction: Laue method –Reciprocal lattice – The rotating crystal method – the powder method

Unit III Chemical bonds:

Primary bonds: Ionic Bond –cohesive energy in ionic solids – covalent bond – metallic bond – secondary bond: Vander Waals, bond – hydrogen bond –bond energy – bond length

Unit IV Defects in solids:

Introduction – Crystal imperfection – Point defects – Line defects – Surface defects – Volume defects – Effects of crystal imperfections

Band Theory of Solids: Introduction – Bloch Theorem – The Kronig Penny Model – Brillouin Zones – Classifications of Solids – Different types of conducting materials

Unit V Superconductivity:

Introduction – Properties of superconductors – Isotopic effect –Meissner effect – Types of super conductors – BCS theory of superconductivity – London equations – Josephson's effect – Applications of superconductors – properties of superconductors

Text Books

Solid state Physics –K.Ilangovan, Viswanathan Pvt Ltd, First Edition (2007).

Unit I – Chapter 1.1 to 1.6

Unit II – Chapter 2.1, 2.2, 2.3.1, 2.3.2, 2.3.5, 2.3.6

Unit III – Chapter 3.2 to 3.5

Unit IV – Chapter 4.1 to 4.3, 10.4 to 10.6

Unit V – Chapter 7.1,7.2,7.2.3,7.2.4,7.3,7.4,7.5.1,7.5.2,7.6,7.7.2,7.8

Reference Books

1. *Solid State Physics, P.K. Palanisamy, 4th Reprint Nov. 2004.*
2. Solid State Physics, R.K.Puri & V.K.Babbar,S.Chand & Company Ltd, Reprint(2009**)**

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PRACTICAL - III				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI	**U3CPYL3**	**2**	**4**	**100**

NON-ELECTRONICS

ANY FIFTEEN EXPERIMENTS

1. Spectrometer – Narrow angle prism
2. B.G – Comparison of mutual inductance
3. B.G – Absolute value of condenser
4. Spectrometer – Cauchy's constant
5. AC bridges – Anderson's bridge
6. AC bridges – Maxwell's bridge
7. B.G – High resistance by leakage.
8. BG – Coefficient of self induction.
9. Spectrometer – Hartman's interpolation formula
10. BG – EMF of a thermocouple
11. Volume of geometric figures using 'C' program
12. Print the 'n' prime numbers using 'C' program.
13. Print Fibonacci series using 'C' program
14. Convert the given temperature scale using 'C' program.
15. Arrange the array of numbers in ascending order using 'C' program.
16. Arithmetic operations of the two matrices using 'C' program.
17. 8- bit Addition using 8085 instructions.
18. 8-bit Subtraction using 8085 instructions.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PRACTICAL IV				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI	**U3CPYL4**	**4**	**6**	**100**

ELECTRONICS

ANY TWENTY FIVE EXPERIMENTS

1. Bridge rectifier with filter.
2. Transistor characteristics – CE, CB mode
3. Single stage amplifier – CE mode
4. Emitter follower
5. Hartley's oscillator
6. Colpitt's oscillator
7. Astable Multivibrator – Transistor
8. Bistable Multivibrator – Transistor
9. Voltage doubler – Diodes
10. Voltage Tripler – Diodes
11. Zener diode – Characteristics
12. Zener diode – Regulated power supply
13. Schmitt Trigger
14. Application of Diodes – Clipping and Clamping
15. Construction of dual power supply – IC 7805 and 7905
16. Astable Multivibrator – IC 555
17. Logic gates AND, OR ,NOT, XOR- Discrete components
18. NAND and NOR – Discrete components
19. Logic gates NAND and NOR – Verification of universal gates.
20. Verification of De-Morgan's Theorems.
21. Verification of Commutative, Associative and Distributive Laws and for OR gates.
22. Verification of Commutative, Associative and Distributive Laws and for AND gates.
23. Half adder and full adder
24. Half Subtractor and full Subtractor

25. Integrator and Differentiator using Op-amp.
26. Inverting and Non-Inverting amplifier
27. K-Map
28. R-S –Flip-Flop Using NAND gate
29. R-S –Flip-Flop Using NOR gate
30. D-Flip-Flop
31. J-K Flip-Flop

EPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER III - MICROPROCESSOR				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI		**5**	**5**	**100**

Objectives

To be able to

- *understand working of digital computer*
- *gain knowledge about types of computer languages.*
- *gain knowledge about microprocessor and assembly language program*
- *clarify the concepts of peripherals and interfaces*

Unit- I Introduction

Introduction - Evolution of Microprocessors -Evolution of Digital Computers - Computer Generations -Central Processing Unit – Memory – Buses - Classification of Computers.

Unit II Computer Languages

Computer Network, Distributed Processing - Input Device - Output Device - Multifunctional Devices -Microprocessor Applications.

Computer languages:

Introduction – Assembly Language – High Level Language – Area of Applications of Various Languages.

Unit-III INTEL 8085

Introduction – INTEL 8085 - ALU – Timing and Control Unit – Registers – Data and Address Bus – Pin Configuration – Op code and Operand – Instruction Word Size.

Unit-IV Instruction set of INTEL 8085

Introduction – Addressing Modes – INTEL 8085 Instruction – Data Transfer Group – Arithmetic Group – Logical Group – Branch Group – Stack, I/O and Machine Control Group.

Unit -V Assembly Language Programming

Introduction – Simple Examples – Addition of Two Numbers; Sum 8-bit – 8-bit Subtraction – Addition of Two 8-bit Numbers; Sum: 16-bits – Find One’s Complement of

an 8-bit Number – Find One's Complement of a 16-bit Number – Find Two's Complement of an 8-bit Number – Find Two's Complement of a 16-bit Number – Shift an 8-bit Number Left By One bit – Mask off Least Significant 4-bit of an 8-bit Number – Mask off Most Significant 4-bits of an 8-bit number – To Find Larger of Two Numbers - To Find Largest number in a data array – An alternate program to arrange an array of data in ascending (or descending order)

Peripheral Devices and Interfacing:

Introduction–Address Space Partitioning – Memory and I/O Interfacing.

Text Book:

Fundamentals of microprocessors and microcontrollers - B. Ram, Reprint 2014 – DhanpatRai Publications (P) Ltd

Unit I: Chapter 1.2 to 1.4, 1.8(1.8.1 to 1.8.3), 1.9 (1.9.1 to 1.9.6), 1.10, 1.12
Unit II: Chapter 1.17, 1.26 to 1.29, 5.1 to 5.4
Unit III: Chapter 3.1 (3.1.1 to 3.1.5, 3.1.7, 3.1.8)
Unit IV: Chapter 4.1, 4.3, 4.6 (4.6.1 to 4.6.5)
Unit V: Chapter 6.1 to 6.5, 6.9 to 6.13, 6.17, 6.18, 6.20, 6.21, 6.22.1, 7.1 to 7.3

Reference Books:

1. Microprocessor /Architecture Programming and applications with 8085- Ramesh Gaonkar
2. Microprocessors and Micro controllers - A. NagoorKani.
3. Digital Electronics Circuits and systems – V.K. Puri.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER IV - COMMUNICATION SYSTEMS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI	**U3EPY4**	**5**	**5**	**100**

Objectives

To be able to

- *Gain knowledge about communication system.*
- *Understand the basic knowledge of the Laser and Fiber optics communications.*
- *Understand the Principle of Satellite Communication systems*

Unit I An overview of communication system and Receivers and Radio Transmitters

General communication system-Historical prospective – Basic constituents of communication systems- classification of RF spectrum – Basic functions of Radio receivers – classification of Radio receivers –salient features of Broadcast receivers-Types of receivers Straight receivers- RFT Receivers –Radio transmitters –classification of Radio transmitters –AM radio transmitters –High power level-low power level-Carrier frequency-Requirement of radio transmitters.

Unit II Lasers and Fiber optics

Introduction to lasers-characteristics of lasers light-principle of laser-Einstein's theory of laser radiation –types of lasers-Material processing – CD ROM-Holography-fiber optics-types of optical fibers-application of optical fibers –Fibers – optical communication system –fiber optic sensors –medical endoscope.

Unit III Wireless systems and standards

Introduction –Second generation Cellular Networks-Third generation Cellular Networks- Wireless local loop-Bluetooth –AMPS-Digital European Cordless Telephone(DECT)-PACS-Personal Access Communication Systems-Personal Handy Phone System.

Unit IV Satellite Communication

Introduction –History of the Satellite – Satellite Orbits-Classification of the Orbits-Types of the Orbits – Launching Satellites –Satellite Communication Frequency-General Structure of the Satellite Communication- Basic Block Diagram of an Earth Station-Advantages and Application of Satellite Communication –Satellite Sub-System –transmission Path and Path Loss-The Terminal Station Receiver Earth Station.

Unit V Recent Development in Communication

Introduction-Paging System-Cellular Telephone-Global Positioning Satellite Fascimile-Videotext.

Textbooks

1. *'Communication Systems' by R. Kumar Anuradha Agencies, 2000.*
   Unit I- Chapter 1(1.1 to 1.4), Chapter 3(3.1 to 3.6) ,Chapter 4 (4.1 to 4.4)
   Unit IV-Chapter 6(6.1 to 6.13)
   Unit V- Chapter 7(7.1 to 7.6)

2. *Unit II- 'Engineering Physics I With Practical' By Five Authors, Hi-Tech Publications, 2004, Chapter 5(5.1to 5.10)*

3. *Unit III- 'Mobile Communications' by R. Janaki, Anuradha Publications,I st Edition, 2008, Chapter 5(5.1 to 5.9)*

Reference Book

1. *'Advanced Electronic Communication Systems' By Wayne Tomasi Sixth Edition, Pearson-Prentice Hall, 2006.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER V - ASTROPHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	VI	**U3EPY5**	**4**	**5**	**100**

Objectives

To be able to

- *Acquire basic knowledge of Astronomy and cosmology.*
- *Understand basic concepts of Space and Time*
- *Gain the knowledge of the Rocket Motion.*

Unit I Space and Time

Some Definitions-Sidereal Time- Sidereal Day-Mean Equinoxes-Uniform Sidereal Time- True Sidereal Time- Sidereal Year-Tropical Year-The Apparent Orbit of the Sun-The Mean Sun – Mean Solar Day-Mean Noon-Relation between Mean Solar Time and Mean Sidereal Time-The Equation of Time-Nature of Equation of Time in a Year-Seasons-Spring-Summer-Autumn-Winter-Causes of Seasons-Length of seasons.

Unit II Astrophysics

Introduction-classification of stars-the Harvard classification system - Hertzsprung - Russel diagram -Luminosity of stars-Stellar Evolution- White Dwarfs-Electron in a White Dwarf stars-Chandrasekhar Limit-Neutron Stars-Black Holes -Supernova Explosion – Photon diffusion time- Gravitational Potential Energy of a Star – Internal temperature of a star - Internal Pressure of a Star.

Unit III Cosmic Rays and The Universe

Discovery of cosmic Rays- Latitude Effect – The East-West effect(Azimuth effect) – Primary Cosmic Rays- Secondary cosmic Rays-Cosmic Ray Showers – Discovery of positron- The Mesons- Van Allen Belts- Origin of Cosmic Rays – The Big Bang Theory-Thermal History of the Universe – Hubble's Law – The Feature of the Universe – Dark Matter.

Unit IV Kepler's Law of Planetary Motion

Central Force-Central Orbit-Differential Equation of a Central Orbit-Planets-Superior and Inferior Planets-Asteroids and Satellites-Kepler's Law of Planetary Motion-Kepler's Law's Deduced From Newton's Law's of Gravitation-Measurement Of Planet's Mass-Velocity and Position of a body in an Elliptic, Parabolic, Hyperbolic Orbits-Lambert's Theorem-Euler's Theorem.

Unit V Rocket Dynamics and Transfer Orbits

Introduction-Motion of a Rocket in Vacuum (Gravity Free Space)- Motion of a Rocket in Gravitational Field- Motion of a Rocket in an Atmosphere-Multi step Rocket-Dynamics of Multi Stage Rocket-Transfer between Orbits-Transfer between Circular, Coplanar Orbits-Parabolic and Hyperbolic Transfer Orbits-Changes in the orbital Elements due to a small and Large Impulses –Transfer between Particles orbiting in a central Force Fields – Hyperbolic escape from the First Body- Entry in to Orbit about the Second Body.

Textbooks

1. *Unit II, III (chapter78,37) Modern Physics by R. Murugeshan, Kiruthiga Sivaprasath, S. Chand &Company LTD, Fourteenth Revised Multicolor Edition, 2009.*
2. *Unit I, IV, V(chapter 4,9,11) Spherical Astronomy and Space Dynamics by Bhupendra Singh, Pragati Prakashan Edition,2008.*

Reference Books

1. K.D.Abhyankar, Astrophysics of the Solar Systems (1999), Universities Press. V.B.Bhatia, 2.Text Book Of Astronomy and Astrophysics with Elements of Cosmology, Narosa Publishing house.

UNDER GRADUATE PROGRAMME IN PHYSICS
(For those who joined 2018 – 2019 onwards under CBCS pattern)

Major

Sem	*Part*	*Subject*	*Subject Code*	*Title of the Paper*	*Remarks*
I	I	LANG. I	P1TA1	Tamil	
	II	LANG. II	P2EN1	English	
	III	CORE	P3CPY3	General Physics	NO CHANGE
			P3CPY2	Thermal Physics	NO CHANGE
				*Practical- I	NO CHANGE
		ALLIED I	P3ACY1	Chemistry	
				*Practical- I	
	IV	ENS	P4ES	Environmental science	
		SBE	P4ECE1	Communicative English	
II	I	LANG. I	Q1TA2	Tamil	
	II	LANG. II	Q2EN2	English	
	III	CORE	Q3CPY3	Optics & Spectroscopy	NO CHANGE
			Q3CPY4	Electromagnetism	NO CHANGE
			Q3CPYL1	Practical- I	NO CHANGE
		#SSP	Q3SPY2	Energy Physics	NO CHANGE
		ALLIED I	Q3ACY2	Chemistry	
			Q3ACYL1	Practical- I	
	IV	VAE	Q4VE	Value Education	
		SBE	Q4ECE2	Communicative English	
III	I	LANG. I	R1TA3	Tamil	
	II	LANG. II	R2EN3	English	

	III	CORE		R3CPY5	Atomic Physics and Relativity	NO CHANGE
					*Practical- II	NO CHANGE
		#SSP		R3SPY3	Biophysics	NO CHANGE
		ALLIED	I	R3ACY1	Chemistry	
					*Practical- II	
			II	R3AMY1	Maths	
	IV	NME		R4NPY1	Physics of Sports	NO CHANGE
		SBE		R4ECE3	Communicative English	
IV	I	LANG.I		S1TA4	Tamil	
	II	LANG.II		S2EN4	English	
	III	CORE		S3CPY6	Nuclear Physics	NO CHANGE
				S3CPYL2	Practical-II	NO CHANGE
		#SSP			MS office	NO CHANGE
		ALLIED	I	S3ACY1	Chemistry	
				R3ACYL2	Practical-II	
			II	S3AMY2	Maths	
	IV	NME			Basics of computer and Home Appliances	Title has been changed
		SBE		S4ECE4	Communicative English	
V	III	CORE			Advanced Mechanics	NO CHANGE
				T3CPY9	Analog Electronics	NO CHANGE
					*Practical -III	NO CHANGE

				*Practical-IV	NO CHANGE
		#SSP		Environmental Physics	No CHANGE
		ELECT. I	T3EPY1	Programming in C	NO CHANGE
			T3EPY2	Nano Science	NO CHANGE
		ALLIED II	T3AMY3	Maths	
	IV	SBE		Soft Skills	
VI	III	CORE		Digital Electronics	No CHANGE
			U3CPY11	Condensed matter Physics	NO CHANGE
			U3CPYL3	Practical-III	NO CHANGE
			U3CPYL5	Practical-IV	NO CHANGE
		ELECT. II		Microprocessor	No CHANGE
			U3EPY4	Communication Systems	NO CHANGE
		ELECT. III	U3EPY5	Astro Physics	NO CHANGE
			U3EPYP	Project	NO CHANGE
		ALLIED II	U3AMY4	Maths	
	IV	SBE		Soft Skills	
	V	NCC/NSS PE/EXT			

**Exams are conducted only at even semesters.*

 # Only for bright students.

POST GRADUATE PROGRAMME IN PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

Sem	*Subject*	*Subject Code*	*Title of the Paper*	*Teach. hrs*	*Credits*	*Exam hrs*	*Marks*		
							Int	*Ext*	*Total*
I	CORE	P6CPYI	Mathematical Physics-I	6	4	3	25	75	100
		P6CPY2	Classical Mechanics	6	4	3	25	75	100
			Applied Electronics	6	4	3	25	75	100
			* Practical –I Electronics	4					
			*Practical-II General Experiments	4					
	#SSP	P6SPY2	Communication System	-	3	3	25	75	100
	ELECT. I	P6EPY1	Programming in C++	4	5	3	25	75	100
		P6EPY2	Numerical Methods						
II	CORE	Q6CPY4	Mathematical Physics-II	6	4	3	25	75	100
		Q6CPY5	Thermodynamics and Statistical Mechanics	6	4	3	25	75	100
		Q6CPY6	Electromagnetic theory	6	4	3	25	75	100
		Q6CPYL1	Practical –I Electronics	4	6	4	40	60	100
		Q6CPYL2	Practical-II – General Experiments	4	6	4	40	60	100
	#SSP	Q6SPY3	Bio Medical Instrumentation	-	3	3	25	75	100
	ELECT. II	Q6EPY3	Instrumentation	4	5	3	25	75	100
		Q6EPY4	Medical Physics						
III	CORE	R6CPY7	Solid State Physics - I	6	4	3	25	75	100
			Quantum Mechanics - I	6	4	3	25	75	100
		R6CPY9	Nuclear Physics	6	4	3	25	75	100
			*Practical-III General Physics	4					
			*Practical – IV -Project	2					
	#SSP		Information technology	-	3	3	25	75	100
	ELECT. III		Introduction to Microcontroller 8051	6	5	3	25	75	100
		R6EPY6	Nanophysics						
IV	CORE	S6CPY10	Solid State Physics - II	6	4	3	25	75	100
		S6CPY11	Molecular Spectroscopy	6	4	3	25	75	100
			Quantum Mechanics - II	6	4	3	25	75	100
		S6CPYL5	*Practical – III General Physics	4	6	4	40	60	100
		S6CPYL4	*Practical – IV Project	2	4	3	20	80	100
	#SSP	S6SPY4	Fiber optic communication	-	3	3	25	75	100
	ELECT.IV		Optoelectronics	6	5	3	25	75	100
			Crystal growth and Thin film						

***Exams conducted only at even semesters.**

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POST GRADUATE PROGRAMME IN PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

Sem	*Subject*	*Subject Code*	*Title of the Paper*	*Hours*		*Credits*	*Marks*			*Page No*
				Teach.	*Exam*		*Int*	*Ext*	*Total*	
I	CORE	P6CPYI	Mathematical Physics-I	6	3	4	25	75	100	57
		P6CPY2	Classical Mechanics	6	3	4	25	75	100	59
			Applied Electronics	6	3	4	25	75	100	61
			* Practical –I Electronics	4						
			*Practical-II General Experiments	4						
	#SSP	P6SPY2	Communication System	-	3	3	25	75	100	63
	ELECT. I	P6EPY1	Programming in C++	4	3	5	25	75	100	65
		P6EPY2	Numerical Methods							67
II	CORE	Q6CPY4	Mathematical Physics-II	6	3	4	25	75	100	69
		Q6CPY5	Thermodynamics and Statistical Mechanics	6	3	4	25	75	100	71
		Q6CPY6	Electromagnetic theory	6	3	4	25	75	100	73
		Q6CPYL1	Practical –I Electronics	4	4	6	40	60	100	81
		Q6CPYL2	Practical-II – General Experiments	4	4	6	40	60	100	82
	#SSP	Q6SPY3	Bio Medical Instrumentation	-	3	3	25	75	100	75
	ELECT. II	Q6EPY3	Instrumentation	4	3	5	25	75	100	77
		Q6EPY4	Medical Physics							79
III	CORE	R6CPY7	Solid State Physics - I	6	3	4	25	75	100	83
			Quantum Mechanics - I	6	3	4	25	75	100	85
		R6CPY9	Nuclear Physics	6	3	4	25	75	100	87
			*Practical-III General Physics	4						
			*Practical – IV -Project	2						
	#SSP		Information technology	-	3	3	25	75	100	89
	ELECT. III		Introduction to Microcontroller 8051	6	3	5	25	75	100	91
		R6EPY6	Nanophysics							93
IV	CORE	S6CPY10	Solid State Physics - II	6	3	4	25	75	100	95
		S6CPY11	Molecular Spectroscopy	6	3	4	25	75	100	97
			Quantum Mechanics - II	6	3	4	25	75	100	99
		S6CPYL5	*Practical – III General Physics	4	4	6	40	60	100	
		S6CPYL4	*Practical – IV Project	2	3	4	20	80	100	
	#SSP	S6SPY4	Fiber optic communication	-	3	3	25	75	100	101
	ELECT.IV		Optoelectronics	6	3	5	25	75	100	103
			Crystal growth and Thin film							105

***Exams conducted only at even semesters.**

 # Only for bright students

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE I- MATHEMATICAL PHYSICS I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I	**P6CPY1**	**6**	**4**	**100**

Objectives

To be able to

- *apply vectors to hydrodynamics*
- *know significant theorems of matrices*
- *study the special functions*
- *understand the properties of Fourier and Laplace transforms*

Unit I Vectors:

Gradient – The Divergence and Gauss's Theorem – The curl of a vector field and Stokes theorem – Successive applications of the operator delta – Orthogonal curvilinear coordinates – Application to Hydrodynamics – Equation of heat flow in solids – The Gravitational Potential – Maxwell's Equation – The Wave Equation.

Unit II Matrices:

Vectors as Matrices and Vector Spaces – Solution of linear equations – Linear transformations – Orthogonal and Unitary transformations – Similarity transformations – Eigen values, Eigen vectors; Characteristic equation of a matrix – Caley - Hamilton theorem – Some important theorems of Eigen values and Eigen vectors – Diagnolization of matrices

Unit III Special functions I:

Bessel's differential equation – The Bessel's function of order n of the second kind –Recurrence formulas for $J_n(x)$ - Expression for $J_n(x)$ when n is half an odd integer – Differential equation whose solutions are expressible in terms of Bessel's function – Modified Bessel's function – Bessel's coefficient

Unit IV Special functions II:

Legendre's differential equation – Rodrigues formula for the Legendre's polynomial – Legendre's functions of second kind – The generating function for $P_n(x)$ – The Legendre's coefficients- n th orthogonality $P_n(x)$ – Expansion of an arbitrary function in a series of Legendre's polynomial – Gamma functions – The value of ½ graph of Gamma function -Beta function – The connection of the Beta and Gamma function.

Unit V Fourier and Laplace transforms:

Introduction – Fourier's transform – Properties of Fourier's Transform – Fourier Transform of a Derivative – Fourier sine and cosine Transforms of Derivatives – Laplace Transform – Properties of Laplace Transforms – Laplace Transforms of the Derivative of a Function – Laplace Transform of Integral

Text Books:

1. *Applied Mathematics for Engineers and Physicists - Pipes and Harvill – III Edition*

McGraw Hill International Book Company (1970)

Unit I: Chapters 8,9,10,11,12,13,14,15,16,17, Appendix E

Unit III: Chapters 2, 4, 6, 7, 9, 10, 13, Appendix B

Unit IV: Chapters 14,15,16,17,18,19,20,22,24,25,26, Appendix B

2. Mathematical Physics - Satya Prakash, First Edition, Reprint (2005), Sultan chand and sons Educational Publishers, New Delhi

Unit II –Chapter 2 – 2.26 to 2.34

Unit V –Chapter 9 – 9.1 to 9.5, 9.9 to 9.12

Reference Books:

1. *Mathematical Physics – B.D.Gupta, Third Edition (2004), Vikas Publishing House, PVT Limited, 2006*
2. *Introduction to Mathematical Physics by Charlie Harper No Edition (2005), Prentice Hall of India PVT. Limited*
3. *Matrices and Tensors in Physics-Joshi, III Edition, Wiley Eastern Limited*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE II – CLASSICAL MECHANICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I	**P6CPY2**	**6**	**4**	**100**

Objectives

To be able to

- *understand Lagrangian methods*
- *learn about the central field motion*
- *study the Hamiltonian formulations*
- *analyse the mechanics of small oscillations*

Unit I Lagrangian Methods:

System of Particles – Conservation of energy – Work energy theorem – Conservative forces – Examples – Generalized coordinates – Degrees of freedom under constraints – D'Alamberts principles – Lagrangian function – Lagrange's equation – Application of Lagrange's equation.

Unit II Central field motion:

Reduction to the equivalent one-body problem – The equation of motion and first integrals – The equivalent one-dimensional problem, and classification of orbits – The virial theorem – The differential equation for the orbit, and integrable power-law potentials – Conditions for closed orbits (Betrand's theorem) – The Kepler problem: Inverse square law of force – The motion in time in the Kepler problem – The Laplace-Runge-lenz vector – Scattering in a central force field – Transformation of the scattering problem to laboratory coordinates.

Unit III Hamiltonian methods:

Hamiltonian equations of motion – Cyclic coordinates and Routh's procedure – Physical significance of the Hamiltonian – Hamiltonian's equation from variational principle – The principle of least action.

Canonical Transformations: The equation of canonical transformations – Examples of canonical transformation – Lagrangian brackets – Poisson brackets – Equations of motion in Poisson bracket notation.

Unit IV Small Oscillations:

Formulation of the problem – The Eigen Value equation and the principal axis transformation – Frequencies of free vibration and normal coordinates – Free Vibrations of a linear triatomic molecule.

Unit V Hamilton – Jacobi Theory:

The Hamilton-Jacobi equation for Hamilton's principal function – The Harmonic oscillator problem as an example of the Hamilton-Jacobi method – The Hamilton –

Jacobi equation for Hamilton's characteristic function – Separation of variables in the Hamilton – Jacobi equation – Action-angle variables in systems of one degree of freedom – Action-angle variables for completely separable systems – The Kepler problem in action-angle variables.

Text Books:

1. *Classical Mechanics – Herbert Goldstein Second Edition, (1980), Adison Wesly, World Student Edition.*

   Unit I – Chapter 1 – 1.1, 1.2, 1.3, 1.4, 1.6

   Unit II – Chapter 3 – 3.1 to 3.11

   Unit III – Chapter 8,9 – 8.1, 8.2, 8.3, 8.5, 8.6,9.1, 9.2, 9.4, 9.5

   Unit IV – Chapter 6 – 6.1, 6.2, 6.3, 6.4

   Unit V – Chapter 10 –10.1 to 10.7

Reference Books:

1. *Classical Mechanics – Gupta Kumar Sharma, Edn (2005). Pragati Prakashan, Meerut.*
2. *Classical Mechanics – J.C.Upadhyaya Second Edition(2005),Himalaya Publishing House*
3. *Introduction to Classical Mechanics – R.G. Takwale and P.S.Puranik Edition (2004), Tata McGraw – Hill Publishing Company Limited, New Delhi.*
4. *Classical Mechanics – K.Sankar Rao, Edition (2005) PHI Private Ltd, New Delhi.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE III - APPLIED ELECTRONICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I		**6**	**4**	**100**

Objectives

To be able to

- *understand the basis of communication systems*
- *make awareness on various modulation techniques*
- *review Boolean laws and theorems*
- *develop wide knowledge about A/D and D/A converters*

UNIT I Communication systems:

Amplitude modulation theory: Frequency spectrum of AM wave, Representation of Am, Power relations in the AM wave, Generation of AM: Basic Requirements, Grid and Plate Modulated Class C Amplifications – Modulated Transistor Amplifiers, Single-Side band Techniques- Evolution and description of SSB, Suppression of carrier, Suppression of side band – Extensions of SSB.

UNIT II Frequency Modulation:

Description of frequency and phase modulation – Mathematical representation of FM – Frequency spectrum of the FM wave – Phase modulation – Intersystem comparisons – Effects of noise on carrier – Pre emphasis and de-emphasize – Other forms of interference – Comparison of wide band and narrow band FM – Stereophonic FM multiple system.

UNIT III Counters:

Asynchronous counters – Synchronous counters – counter modulus – mod- 3 counter – mod – 6 counters – Decade counter – Shift counter – mod 10 shift counter with decoding – Digital clock.

UNIT IV Logic circuits:

Boolean laws and theorems – Sum of products methods – Truth table to Karnaugh maps-Pairs, Quads and Octets – Karnaugh simplifications – Don't Care Conditions-Product of sums method – Product of sums simplification.

Data Processing Circuits: Multiplexers – Demultiplexers –1-OF-16 Decoder – BCD-TO-DECIMAL Decoders – Seven-Segment Decoders – Encoders.

UNIT V D/A and A/D Conversions:

Variable-Resistor networks – Binary ladders – D/A Converters – D/A Accuracy and resolution – A/D converter – Simultaneous conversion – A/D Converter counter method-Continuous A/D Conversion – A/D Techniques-Dual Slope A/D Conversion – A/D Accuracy and resolution

Text Books:

1. *Applied Electronics by Davis Kennedy, Fourth edition, Tata MC Graw Hill Ltd.,*

   Unit I – Chapter – 3 & 4

   Unit II-Chapter 5.1 and 5.2

2. *Digital Principles and Application by Malvino Leach, Fifth edition, (2005), TATA Mc Graw Hill.*

   Unit III-Chapter 10 – 10.1, 10.3, 10.4, 10.5, 10.7, 10.8, 10.9,

   Unit IV -Chapter 3, 4.1 to 4.6

   Unit V- Chapter 11

Reference Books:

1. *Digital Electronics – V.K.Puri, Third Edition,Tata MC Graw Hill Publication.*
2. *Applied Electronics by R.S.Sedha, First Edition, (2006), S.Chand Pub. Ltd.,*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER I COMMUNICATION SYSTEMS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I	**P6SPY2**		**3**	**100**

Objectives

To be able to

- *understand the principles of semiconductor devices*
- *have a detailed knowledge of the different types of digital circuits*
- *understand the elements of RADAR and television*
- *understand the modes of wave propagation*

Unit I Semiconductor Devices

FET as a voltage variable resistor – Common source Amplifier and Common drain Amplifier at high frequencies – Silicon controlled characteristics – SCR Power Control – Tunnel Diode

Unit II Digital Circuits and Devices

Logic Families – combinational Logic – Function of Combinational Logic – Flip Flops and other Multivibrator –**Counters**
Shift Registers: Memories RAM, ROM, PROM, EPROM-Charge coupled Devices (CCD)

Unit III Signal Processing Circuits

Wave form Generators and Wave shaping circuits- Sinusoidal Oscillator Phase shift Oscillator – Wien Bridge Oscillator- Crystal Oscillator Multivibrator, Comparators – Schmitt Trigger – Square wave & Triangular Wave Generators- Pulse Generators -

Unit IV Radar and Television

Elements of a Radar System – Radar Equation – Radar Performance Factors – Radar Transmitting Systems – radar Antennas – Duplexers – radar Receivers and indicators –Black and White TV Transmission and Reception – Color TV transmission and reception.

Unit V Antennas and Wave Propagation

Terms and Definition – Effect of Ground on Antennas – Grounded $\lambda/4$ Antenna – ungrounded $\lambda/2$ Antenna – antenna Arrays – Broad side and End side Arrays – antenna Gain - Directional high frequency antennas – wideband and special purpose antennas – sky wave propagation- ionosphere – Ecles and Larmor Theory – Magneto ionic Theory – Ground wave Propagation

Text Books:

1. *Physics of Semiconductor Devices-Wiley Eastern*

2. Integrated Electronics-Millman & Halkias-Tata McGraw Hill

3. Microelectronics-Millman & Grabel-McGraw Hill

4. Digital Principles and Applications-Malvino- McGraw Hill

5. Electronic Communication Systems-George Kennedy & Davis -Tata McGraw Hill

6. Electronics & Radio Engineering-F.E.Terman- McGraw Hill

7. Communication Systems-Carlson- McGraw Hill

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER –I(A) PROGRAMING IN C++				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I	**P6EPY1**	**4**	**5**	**100**

Objectives
To be able to

- *develop skill for developing the different programs*
- *appreciate and apply the programming concepts*
- *know overloading, inheritance concepts*
- *envelop logical thinking*

Unit I: Data types operators, statements and writing C++ Program

Identifiers and keywords – Constants – C++ operators – Type conversion - Declaration of variables – Statements – Simple c++ Programs – Features of iostream.h – Manipulated functions – Input output (I/O) stream flags.

Unit II: Control statements and functions

Conditional Expressions – Switch Statement – Loop statements – Breaking Control statements – Defining a function – Types of function – Actual and formal arguments – Local and Global variables – Default Arguments – Multifunction Program

Unit III Arrays and Pointers

Array Notation, Declaration, Initialization- Processing with array – Arrays and functions – Multidimensional Arrays – Character Array – Pointer Declaration – Pointer Arithmetic – Pointers and Function – Pointers and Arrays

Unit IV Structures, Unions and Bit Fields:

Classes Declaration, Initialization of structure – Functions and structures – Arrays of structures – Arrays within a structures – Structures with a structure – Pointers and structures – Unions – Bit Fields –Structures and classes – Declaration of class – Member function – Defining the object of a class – Accessing a member of a class – Array of class objects – Pointers and classes – Unions and classes – Classes within classes.

Unit V Inheritance and Overloading:

Single Inheritance – Types of Base Classes – Types of Derivation – Function overloading – Operator overloading.

Text Book:

Programming in C++ - D.Ravichandran, II Edition, TATA MC GRAW Publishing Company.

Unit I - 1.1-1.4, 2.1-2.6
Unit II – 3.1-3.4, 4.2-4.8
Unit III – 5.1-5.7, 6.1-6.4
Unit IV-7.1-7.9, 8.2-8.10
Unit V- 10.2-10.4, 11.1, 11.2

Reference Book:

Programming in C++ - E. Balagurusamy, Fourth Edition Copyright @2008, Tata MC Graw Hill Ltd.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER-I (B) NUMERICAL METHODS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I	**P6EPY2**	**4**	**5**	**100**

Objectives

To be able to

- *recall the curve fitting procedures*
- *analyse different interpolation techniques*
- *rejuvenate the concepts of numerical integration and differentiation*
- *solve partial differential equations*

Unit I: Solution of Algebraic and Transcendental Equations:

The Bisection Method-The Iteration method –The Method of False position – Newton Raphson Method-Generalized Newton's Method – Ramanujan's Method – Muller's Method – Quotient Difference method.

Curve fitting –Least squares curve fitting procedures – Fitting a straight line-nonlinear curve fitting – Curve fitting by sum of exponentials

Unit II: Interpolation

Finite Differences-Forward Differences – Backward differences – Central Differences – Detection of errors by use of difference tables – Differences of a polynomial – Newton's formula for interpolation – Central difference interpolation formula – Gauss's central difference formula – Stirling's formula – Bessel's formula-Everett's formula – Interpolation with unevenly spaced points: Lagrange's interpolation formula – Hermite's interpolation formula – Divided difference and their properties – Newton's General interpolation formula – Interpolation by iteration – Inverse interpolation – Method of successive approximations – Double interpolation.

Unit III: Numerical integration and differentiation:

Numerical differentiation – Errors in numerical differentiation – Numerical integration – Trapezoidal rule – Simpson's 1/3 rule-Simpson's 3/8 rule – Numerical solution of ordinary differential equations: Introduction-solution by Taylor's series – Picard's method of successive approximations – Euler's method – Modified Euler's method – Runge kutta method.

Unit IV: Matrices and linear systems of equations

Introduction – Matrix operations – Transpose of a Matrix – Inverse of a Matrix – Rank of a matrix – Consistency of a linear system of equations – Vector and matrix norms – Solution of linear systems – Direct methods – Matrix inversion method –

Gaussaian elimination method – Modification of the gauss method to compute the inverse – Method of factorization – Solution of linear systems – Iterative methods – The eigen value problem**.**

Unit V: Numerical solution of partial differential equations:

Finite difference approximations to derivatives – Laplace equations – Jacobi's method – Gauss-seidel method – Successive over relaxation.

Text Book:

Introductory methods of Numerical methods – S.S.Sastry, Third Edition, Prentice- Hall of India Private Limited, New Delhi.

Unit I: Chapter (2.2 to 2.7, 2.10) Chapter (4.2, 4.2.1 to 4.2.3)

Unit II: Chapter (3.3 – 3.7.4, 3.9 – 3.9.3, 3.11, 3.12, 3.13)

Unit III: Chapter (5.2-5.2.1, 5.4-5.4.3) Chapter (7.2-7.4, 7.4.2, 7.5)

Unit IV: Chapter (6.1-6.3.4, 6.3.7, 6.4, 6.5)

Unit V: Chapter (8.1-8.3.3)

Reference Book:

Numerical methods by Veerarajan Ramachandran, second edition, (2006), TATA MC GRAW HILL Ltd.,

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE IV- MATHEMATICAL PHYSICS – II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6CPY4**	**6**	**4**	**100**

Objectives

To be able to

- *use the complex variables in solving integrals*
- *have an introductory idea of tensors*
- *understand the group theory concepts*
- *study statistical and probability concepts*

Unit I: Complex Variables:

Introduction – Function of complex variable– Cauchy Riemann equations – Line integral of complex functions– Cauchy integral theorem (simple proof) – Cauchy integral formula –Taylor's and Laurent's series..

Unit II: Residue:

Cauchy Residue theorem – Singular points of an analytic function – The point at infinity – Evaluation of residues – Evaluation of definite integrals – Jordan's lemma.

Unit III: Tensors

Qualitative introduction – Coordinate transformation – Scalars, Contravarient vectors and Covariant vectors – Addition, Multiplication and contraction of Tensors – Associated Tensors – Differentiation of an invariant – Differentiation of Tensors – Intrinsic and covariant derivatives of tensors of higher order – Applications of tensor analysis.

Unit IV: Group theory

Introduction –Definitions of theorems of group theory- defining properties of a group- some examples of groups – Sub groups – Classes – Classes of symmetry operations – Representation of groups – The great Orthogonality theorem and its consequences – Character table – Representation for cyclic groups

Unit V: Probability

The Binomial Distribution – The Poisson distribution – The normal or Gaussian distribution – Distribution of a sum of normal variates – Applications to experimental measurements – The standard deviation of the mean.

Text Books:

1. *Applied mathematics for Engineers and Physicists - Pipes and Harvill, III Edition (1970), Mc Graw Hill International Book Company.*

Unit I – Chapter1 (1 to 8)

Unit II – Chapter 1(9 to 12, 14, 15)

Unit III – Appendix E (19, 21 to 27)

Unit V – Chapter 16(11 to 16)

2. Chemical Application of Group theory - F. Albert Cotton – Third Edition, John wiley and sons Private Limited

Unit IV – Chapter 1, Chapter (2.1 to 2.4,), Chapter (3.13) Chapter (4.1,4.3 to 4.5)

Reference Books:

1. *Matrices and Tensors in Physics – Joshi, III Edition, Wiley Eastern Limited*

2. Group theory and its applications to chemistry by K.V. Raman– Reprint Edition (2005) –TATA MC GRAW HILL limited

3. Mathematical Physics – B. D. Gupta, Third Edition (2004), Vikas Publishing House, Private Limited

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE V- THERMODYNAMICS AND STATISTICAL MECHANICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6CPY5**	**6**	**4**	**100**

Objectives

To be able to

- *study the Law of Thermodynamics*
- *apply the Laws of Thermodynamics*
- *understand the Application and concept of Ensembles.*
- *appreciate the difference of classical and quantum statistics*

Unit I: Thermodynamics:

First law of thermodynamics – The Two specific heats – Second law of thermodynamics and entropy – Latent Heat Equations – Clausius theorem – Entropy; a Point Function – Entropy as a thermodynamic coordinate – T-S indicator diagram – Third law of thermodynamics; Nernst Heat theorem – Calculation of entropy change in different process – Maxwell's Thermodynamical Relations – Thermodynamical potentials – Maxwell's Equation from Thermodynamical potentials – The two Tds equations.

Unit II: Applications of laws of thermodynamics:

Application of Tds equation – Clausius Clapeyron's latent heat equation – The Triple point; Thomson's Theorem – Perfect gas equation – Joule-Thomson's theorem – The energy equation – Ratio of two Specific heats – Adiabatic stretching of a wire – Application to Paramagnetic salts; Magneto-Caloric effect – Application to surface Films –Application to Chemical Thermodynamics.

Unit III: Statistical mechanics:

Phase Spaces – concept of ensembles – Canonical ensemble – Thermodynamical relations in canonical ensemble –Micro canonical – Grand Canonical ensembles.

Properties of Gases:

Partition function for the system and for the particles – Translational Partition function – Gibb's paradox – Boltzmann equipartion theorem – Maxwell distribution of velocities.

Unit IV Bose-Einstein and Fermi - Dirac Statistics:

Symmetric and Antisymmetric wave functions – Bose-Einstein and Fermi-Dirac distribution – Weak and strong degeneracy of Perfect gas – Bose-Einstein condensation – Blackbody radiation: Photons.

Unit V: Applications of Statistics:

Introduction – Specific Heat of Solids – Dulong and Petit's Law – Deduction of Dulong and Petit's law from Classical statistics –Temperature Variation of specific heat – Einstein's theory of specific heat of solids – Debye's theory of specific heat solved examples – Specific heat of gases – Temperature variation of specific heat of Diatomic Gases – Quantization of various contributions to energy of a Diatomic molecule – Specific heat of diatomic gases.

Text Books:

1. Thermodynamics and Statistical Physics – Sharma and Sarkar Edition (2005) Himalaya publishing house.

Unit I – Chapter2, 5,6 – 2.7,2.9,5.10 to 5.14,5.20,5.21,6.1 to 6.4

Unit II - Chapter 6 – 6.5 to 6.16

Unit V – Chapter 14 – 14.1 to 14.10

2. Statistical Mechanics and properties of matter – E. S. R. Gopal (No Edition)

Unit III – Chapter 1, 2 (Relevant Sections)

Unit IV – Chapter3

Reference Books:

1. Thermodynamics – P.C.Rakshit, Fourth Edition (1983), The New Book Stall,

2. Statistical Thermodynamics – MC Gupta, First Reprint Wiley Eastern Limited.

3. Statistical Mechanics – Gupta and Kumar, First Edition (1972), Pragati Prakashan, Meerut

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VI - ELECTROMAGNETIC THEORY				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6CPY6**	**6**	**4**	**100**

Objectives

To be able to

- *understand the concepts of electrostatic fields*
- *review the Maxwell's equations*
- *analyse electromagnetic wave propagation*
- *induce the knowledge about wave guides*

Unit I Electrostatic Field I:

The Equations of Poisson and of Laplace – Conductors – Calculation of the Electric Field Produced by a simple charge distribution – The electric dipole – The linear electric quadrupole – Electric multipoles.

The Electric Polarization – Electric Field at Exterior point – Electric Field at an Interior point – The local field – The Electric susceptibility – The Divergence of E. The Electric Displacement D – Calculation of Electric Fields Involving Dielectrics – The Claussius Mossotti Equation.

Unit II Electrostatic Field II:

Continuity of V, D, E at the interface between two different media – The Uniqueness theorem

The Vector potential – The scalar potential – Magnetic forces – The magnetic induction B. The Biot – Savart law – The divergence of the magnetic induction B – the vector potential – The curl of the magnetic induction B – Ampere's Circuital law.

Unit III Magnetic Fields:

The Faraday induction law – The induced electric field intensity E in terms of the vector potential A – Induced electromotance in a moving system

The conservation of electric charge – The potential V and A – The lorentz condition – The divergence of E and the non homogeneous wave equation for V – The non homogeneous wave equation for A – The curl of B – Maxwell's equations.

Unit IV Propogation of em waves:

Plane electromagnetic waves in free space – The E and H vectors in homogeneous, isotropic, linear and stationary media – Propagation of plane electromagnetic waves in non-conductors – Propagation of plane electromagnetic waves in Conducting Media – Propagation of plane electromagnetic waves in good conductors.

Unit V Guided em waves:

Propagation in Straight Line – The Coaxial Line – The Hollow Rectangular Wave Guide – Electric Dipole Radiation

Text Book:

Electromagnetic fields and waves – Paul Lorrain & Dale R. Corson – CBs Publ., New Delhi (1986) – Second Edition.

Unit I - Chapter 2.6 to 2.11, 3.1 to 3.8

Unit II – Chapter 4.1, 4.2, 6.4, 6.5, 7.1 to 7.7

Unit III - Chapter 8.1 to 8.3, 10.1 to 10.7

Unit IV – Chapter 11.1 to 11.5

Unit V – Chapter 13.1 to 13.3, 14.1

Reference Book:

Fundamentals of electromagnetic theory by John R.Reitz,Federih . J Wilford &Robert W. Christry,III Edition, Narosa Publication house, New Delhi.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER - II BIOMEDICAL INSTRUMENTATION				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6SPY3**		**3**	**100**

Objectives

To be able to

- *understand human physiological system.*
- *gain knowledge about electrodes and transducers.*
- *understand advances* in biomedical instrumentation.

UNIT I HUMAN PHYSIOLOGICAL SYSTEMS

Introduction – cells and their structure – nature of cancer cells – transport of ions through the cell membrane – resting and action potentials – bio-electric potentials – nerve tissues and organs – different systems of human body.

UNIT II BIOPOTENTIAL ELECTRODES AND TRANSDUCERS

Design of medical instruments – components of the Bio-medical instrument system – electrodes – transducers – active transducers – passive transducers – photoelectric type – thermistor – capacitive transducers.

UNIT III PHYSIOLOGICAL ASSIST DEVICES

Pacemakers – pacemaker batteries – artificial heart valves – defibrillators – heart-lung machine – kidney machine.

UNIT IV SAFETY INSTRUMENTATION

Radiation safety instrumentation – physiological effects – micro and macro shock – electrical accidents in hospitals – devices to protect electrical hazards – hospital architecture.

UNIT V ADVANCES IN BIOMEDICAL INSTRUMENTATION

Computers in medicine – laser instrumentation – computer tomography – positron emission tomography (PET) – biomaterials – material response.

Text Book

Biomedical instrumentation - Dr. M. Arumugam, second edition (2002).

UNIT I : Chapter 1.1-1.8

UNIT II : Chapter 2.2, 2.3, 2.4 (2.4.1-2.4.7), 2.5(2.5.1-2.5.6), (2.5.10, 2.5.11, 2.5.13)

UNIT III : Chapter 5.2 (5.2.1-5.2.3(ii & iii)), 5.3 (i, ii), 5.4, 5.5, 5.7(5.7.1, 5.7.2), 5.8.

UNIT IV : Chapter 9.1-9.7

UNIT V : Chapter 10.2, 10.3, 10.7, 10.11, 10.14

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER – II (A) INSTRUMENTATION				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6EPY3**	**4**	**5**	**100**

Objectives

To be able to

- *know the principles of measuring instruments.*
- *understand the display devices and systems.*
- *gain knowledge about digital instruments.*
- *study the working of the signal generators*

Unit I. Measurements:

Introduction – Performance characteristics – Static characteristics – Error in measurement - Types of error – Sources of error – Dynamic characteristics – Statistical analysis.

Unit II: Basic measuring instruments:

D.C Ammeter – multi range ammeters – The Aryton shunt or universal shunt – requirements of a shunt – Extending ammeter range – Basic meter as a DC voltmeter – DC voltmeter – Multi range voltmeters – Extending voltmeter range – Loading – AC voltmeter using rectifiers – Consideration in using analog voltmeter – Ohmmeter – Transistor tester.

Unit III: Digital instruments:

Introduction – Ramp technique – Dual slope integrating type DVM – integrating type DVM – Most commonly used principles of ADC – 3(1/2) digits – Resolution and sensitivity of digital meters – Digital multi meters – Digital frequency meter –Time base selector – Measurement of time – Capacitance meter.

Unit IV: Display devices & systems:

Digital display system & indicators – Classification of displays – Display devices – LED – LCD – Segmental display using LED's – Printer's – classification of printers – Printer character set – Drum wheel – Line printers – Drum printer – Dot matrix printer – Dual beam CRO – Dual trace oscilloscope – Applications of oscilloscope.

Unit V: Signal generators:

Introduction – Fixed frequency AF oscillator – Variable AF oscillator – Standard signal generator – AF sine & square wave generator – Function generator – square wave & pulse generator. Objective of a DAS – Signal conditioning of inputs – single channel DAS – Multi channel DAS – Computer based DAS – Data loggers – Data transmission

systems – Advantages & disadvantages of digital transmission over analog – Full binary transmission – Modems.

Text Book:

Electronic Instrumentation – H.S. Kalsi, II Edition Tata McGraw-Hill Publishing Company Limited

Unit I – Chapter 1.1 to 1.8

Unit II – Chapter 3.1 to 3.5, Chapter 4.1 to 4.6, 4.12, 4.20, 4.21, 10.11

Unit III - Chapter 5.1 to 5.5, 5.8, 5.9, Chapter 6.2 to 6.4, 6.13

Unit IV – Chapter2.7 to 2.19, Chapter 7.15, 7.30

Unit V – Chapter 8.1 to 8.5, 8.7 to 8.9 Chapters 17.2 to 17.6, 17.8

Chapter 18.2, 18.3, 18.7.1, 18.8

Reference Book

Modern Electronic Instrumentation and Measurement Techniques by Albert D.Helfrick &William D.Cooper, Ninth printing.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER II (B) MEDICAL PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6EPY4**	**4**	**5**	**100**

Objectives

To be able to

- use Physics of sound and Light in Medicine
- know the physics of diagnostic X-rays
- understand the concepts of Radio isotopes and Radio therapy
- review the concepts of Medical Physics
-

Unit I Sound in Medicine:

General Properties of Sound –The body as a Drum (Percussion in medicine), The Stethoscope, Ultrasound Pictures of the body, ultrasound to measure motion, Physiological effects of ultrasound in therapy, the production of speech. Physics of the ear and Hearing – The Outer ear, the middle ear, the inner ear, Sensitivity of the ears, Testing your hearing, Deafness and hearing aids

Unit II Light in Medicine:

Measurement of Light and its units, Applications of visible light in Medicine, Applications of ultraviolet and infrared light in medicine, Lasers in medicine, Applications of Microscopes in Medicine. Physics of Eye and vision: Focusing Elements of the eye, some other elements of the eye, the retina-The light detector of the eye, How sharp are your eyes? Optical illusions and related phenomena, defective vision and its correction, color vision and chromatic aberration, Instruments used in ophthalmology.

Unit III Physics of diagnostic X rays:

Production of X-ray beams, How X-ray is absorbed? Making an X-ray image, Radiation to patients from X-rays, Producing live X-ray images-Fluoroscopy, X-ray slices of the body, Radiographs taken without film.

Unit IV Physics of Nuclear Medicine (Radio isotopes in Medicine):

Review of basic characteristics and units of radioactivity, sources of radioactivity for nuclear medicine. Statistical aspects of Nuclear medicine, Basic instrumentation and its clinical applications, Nuclear medicine imaging devices, Physical Principles of nuclear medicine imaging procedures, Therapy with radioactivity, Radiation doses in nuclear medicine.

Unit V Physics of Radiation Therapy:

The dose units used in radiotherapy-the Red and the Gray, Principlesof radiation therapy, A short courses in radiotherapy treatment planning, Mega voltage therapy, Short distance radiotherapy or Branchy therapy, Other radiation sources, closing thought on Radiotherapy.

Text Book:

Medical Physics by John R. Cameroon and James G. Skofronick, John Wiley& Sons, New York (1978).

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VII – ELECTRONICS - PRACTICAL - I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6CPYL1**	**4**	**6**	**100**

(Any twelve)

1. Construction of dual power supply using IC 7812 and IC 7912 &
   OP-AMP I - Adder, Subtractor
2. OP-AMP II- Inverter, Non-Inverter, Differentiator, Integrator.
3. 4-bit up and down counter
4. Active Filters using IC 741
5. FET Characteristics
6. FET Amplifier
7. Karnaugh map reduction and logic circuit implementation
8. Astable operation – 555 Timer
9. Astable and Bistable Multivibrator - Transistor
10. Half Subtractor and Full Subtractor
11. Relaxation Oscillator – UJT
12. Wien bridge oscillator – Transistor
13. Colpitt's Oscillator – Transistor
14. Hartley's Oscillator – Transistor
15. Miller integrator
16. Solving Simultaneous Equations
17. Four bit binary Adder and Subtractor
18. Schmitt trigger – Transistor
19. Digital to Analog Converter
20. Multiplexer - 8 to 1.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE VIII - GENERAL EXPERIMENTS - PRACTICAL - II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q6CPYL2**	**4**	**6**	**100**

(Any twelve)

1. Cauchy's constant
2. Hyperbolic fringes
3. Maxwell's Bridge
4. Owens's Bridge
5. Wien's Bridge Network
6. Resolving power of a prism
7. Numerical Integration – I (Simpson's 1/3 rule & Trapezoidal rule)
8. Numerical Integration – II (Bisection and Newton Raphson method)
9. Numerical Integration – III (Runge Kutta Method)
10. Elliptical Fringes
11. Refractive index of liquids using Hollow Prism
12. Optic Bench Biprism Experiments
13. Edser Butler Fringes
14. Anderson Bridge
15. Refractive Index of Liquids using Laser

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE IX- SOLID STATE PHYSICS – I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R6CPY7**	**6**	**4**	**100**

Objectives

To be able to

- *understand the different crystal structures*
- *know about the physical properties of different metals*
- *appreciate the different physical phenomena*
- *have a clear idea about the band gap in semiconductors*

Unit I Crystal Structure and reciprocal lattice

Periodic Arrangement of atoms, concepts of lattice, lattice translation vectors, primitive lattice cells – two and three dimensional lattice types – miller indices of crystal planes – simple crystal structures like sodium chloride type, Cesium Chloride type-Hexagonal and face centered close packed structures – diamond structures and Cubic Zinc Sulphide structure – Diffraction of waves by crystals: Bragg's law – Reciprocal lattice vectors – Laue equations – Brillouin Zones- Reciprocal lattices to sc, bcc and fcc lattices- Fourier Analysis of the basis and structure factors of bcc and fcc lattices.

Unit II Crystal binding and elastic constants

Crystal Binding and Elastic constants: Inert gas crystals – Vander walls-London interaction – cohesive energy – Ionic crystals – Evaluation of madelung constant - Covalent crystals – metallic crystals – Hydrogen bonds – atomic radii – analysis of elastic strains – elastic stiffness and compliance constants – elastic waves in cubic crystals

Unit III Phonons

Vibrations of linear monoatomic and diatomic chains – quantization of elastic waves – phonon momentum-Planck distribution for a system of identical harmonic oscillators-periodic boundary condition and density of states in one and two dimensions-Einstein and Debye's theories of specific heat – Anharmonicity of lattice vibrations – thermal expansion-Thermal conductivity and Umklapp processes

Unit IV Free electron Fermi gas and energy band

Energy levels in one dimension: Fermi Dirac distribution for a free electron gas-periodic boundary condition and free electron gas in three dimensions-Heat capacity of the electron gas-Ohm's law – Matthiessen's rule and Umklapp process-Hall effect – Wiedmann Franz law-Nearly free electron model and the origin and magnitude of the energy gap-Bloch functions-Motion of an electron in a periodic potential –Kronig Penny model-Bloch theorem – Approximate solution near a zone boundary

Unit V Semiconductor crystals, Fermi surfaces and metals

Band gap in semiconductors**:** Equations of motion-holes and effective mass-Intrinsic mobility-Donor and acceptor states and thermal ionization of donors and acceptors-Reduced and periodic zone schemes construction of Fermi surfaces-Electron orbits-Tight binding method for energy bands-Wigner Seitz method and cohesive energy-Quantization of orbits in a magnetic field-De hass-Van Alphen effect.

Text Book

Introduction to solid state Physics – C. Kittel, (VII Edition) 1995, John Wiley & Sons

Chapters: 1 to 9

Reference Books

1. *Solid State Physics - P.K. Palanichamy, Fourth Reprint Nov 2004, Scitech Publications (India) Pvt.Ltd*
2. *Solid State Physics – Gupta. Kumar, Fifth Edition, K.Nath & Co.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE X- QUANTUM MECHANICS I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III		**6**	**4**	**100**

Objectives

To be able to

- *understand the quantum concepts.*
- *appreciate the development of wave mechanics*
- *appreciate the basic concepts of angular momentum and parity.*

Unit I Towards quantum mechanics

Limitation of the Old Quantum Theory-The Motion Of a Free Wave Packet; Classical Approximation and the Uncertainty Principle -The Formulation of Quantum Mechanics-A free Particle in one dimension-Generalization to Three Dimensions-The Operator Correspondence, and the Schrodinger Equation for a Particle Subject to Forces-Normalization and Probability Interpretation-Non Normalizable Wave Functions and Box Normalization-Conservation of Probability- Expectation Values; Ehrenfest's Theorem-Admissibility Condition on the Wave Function.

Unit II Representations, Transformations and Symmetries

Quantum States; State Vectors and Wave Functions – The Hilbert Space of state Vectors; Dirac Notation – Dynamical Variables and Linear Operators – Representations-Continuous Basis – The Schrödinger Representation – Degeneracy; Labeling by commuting observables – Change of Basis; unitary Transformations – Unitary transformations induced by change of coordinate System: Translations- Unitary Transformation induced by rotation of Coordinate system – The algebra of rotation Generators – Transformation of Dynamical Variables – symmetries an Conservation laws

Unit III The Schrodinger equation and stationary states

Stationary States: The Time-Independent Schrodinger Equation-A Particle in a square Well Potential-Bound States in a Square Well-The Square Well: Non localized States-Square Potential Barrier-Multiple Potential Well: Splitting of Energy-Levels : Energy Bands.

Unit IV General Formalism of wave mechanics

The Schrodinger Equation and the Probability Interpretation for an N-Particle System-The Fundamental Postulates of wave Mechanics-The Dirac Delta Function-Observables: Completeness and Normalization of Eigen functions. **Simple Harmonic Oscillator:** The Schrodinger Equation, and Energy Eigen values-The Energy Eigen function-Properties of Stationary States.

Unit V Exactly soluble Eigen value problem

The Angular Momentum and parity; The Angular Momentum Operators-The Eigen value Equation for L^2; Separation of Variables-Admissibility Conditions on Solutions; Eigen values-The Eigen function: Spherical Harmonics-Physical Interpretation-parity.

Text Book

1. *A Text Book of Quantum Mechanics – P.M. Mathews and Venkatesan, , Tata McGraw-Hill Publishing Company Limited, Seventh Reprint (2000)*

Unit I – Chapter 1.12, 1.14, 1.19, 2.2 to 2.8.

Unit II – Chapter 7 – 7.1- 7.12

Unit III – Chapter 2.9 to 2.14

Unit IV – Chapter 3.1, 3.2, 3.6, 3.7, 4.1 to 4.3

Unit V – Chapter 4.6 to 4.11

Reference Books*:*

1. *Quantum Mechanics – Leonard I. Schiff, Third Edition, International student edition.*
2. *Quantum Mechanics – Gupta Kumar Sharma, Twenty sixth edition, Jai Prakash Nath &Co, Meerut (2007).*
3. *Quantum Mechanics – V.K. Thankappan, Second edition, Wiley eastern Ltd.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XI- NUCLEAR PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R6CPY9**	**6**	**4**	**100**

Objectives

To be able to

- *gain knowledge about the properties of Nucleus.*
- *understand the principle of working of Nuclear reactors.*
- *get in-depth knowledge about the phenomena of Radioactivity*
- *gather information about nuclear fission and fusion*

Unit I General Properties of Nucleus:

Nuclear size – mass – angular momentum – magnetic dipole moment – electric quadrupole moment – statistics – determination of nuclear radius: life time of emitters, neutron scattering – nuclear forces – binding energy – semi empirical mass formula – liquid drop model.

Unit II Radioactivity:

α - Decay – range, velocity and energy of α particles – Geiger Nutal law - α particles spectra – Gamow's theory of α decay - β decay – features of β Spectrum – neutrino hypothesis – Fermi's theory of β decay – Co^{60} experiment – neutrino helicity and its determination - γ radiation: Selection rules.

Unit III Nuclear reactions:

Types of nuclear reactions – Q value Equation-Nuclear Reaction kinematics – exothermic and endothermic reactions – threshold energy – nuclear cross section – partial wave analysis of nuclear cross section – Nuclear transmutation - compound nucleus theory – Breit Wigner single level formula.

Unit IV Nuclear Fission and Fusion:

Types of fission – Distribution of fission products – Neutron emission in fission – fissile and fertile materials, spontaneous fission – Deformation of liquid drop: Bohr and Wheelers theory – Quantum effects- Nuclear fusion and Thermo nuclear Reaction –

Controlled Thermo nuclear reactions (Hydrogen bomb, Different methods for the production of fusion reactions).

Unit V Nuclear Fission Reactors:

Nuclear chain reaction (Four Factor Formula) – The Critical size of a Reactor (Reactor buckling, on leakage factors, Effect of Reflectors) – General aspects of Reactor design – classification of reactors: Research reactors (Graphite – moderated, water boiler, swimming pool, Light water moderated; Heavy water moderated)

Text Book

Nuclear physics – D. C. Tayal, Fourth Edition (1995), Himalaya Publishing House, Bombay.

Unit I – 1.3, 1.6, 1.7, 8.1, 8.4, 9.3

Unit II – 5.1 to 5.6, 6.1to 6.3, 6.5, 6.7, 6.8, 7.1 to 7.3

Unit III – 10.1 to 10.3, 10.6, 10.8 to 10.10, 10.14

Unit IV – 13.1 to 13.3

Unit V – 15.1 to 15.3, 15.4 (research reactors only)

Reference Books:

1. *Nuclear Physics – Irving Kaplan, Second edition, Narosa publishing House.*
2. *Elements of Nuclear Physics – M.L. Pandya – R.P.S.Yadav, Sixth edition, Kedar Nath RamNath & Co.*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER – III INFORMATION TECHNOLOGY				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III			**3**	**100**

Objective:

- *identify various categories and sub-categories of software*
- *understand the role of operating systems in running computer hard wares*
- *understand the concepts involved in processing*
- *outline the various functions performed by components of data communicating equipments*

Unit I Computer Software

Introduction – Classification of softwares- computer programming languages-language translators- sub-routine programs-categories of application software-application program packages-acquiring software

Unit II Operating Systems

Introduction-Advantages and drawbacks of operating system-functions of operating systems-types of operating systems-commonly used and popular operating systems

Unit III Data Storage and Retrieval

Introduction – file management software-file organization-choice of file organization method-file handling – Grandfather –Father –son data Storage

Unit IV Data Communication and Networking

Introduction – Data Communication Terminology-computer networks – Networking options-communication interface devices

Unit V Internet and Emerging Technologies

Internet: An introduction working of Internet-Electronic commerce-Electronic data interchange-Intranet and Extranet-other emerging Technologies

Text Book

Computers and Information Technology – V.K. Kapoor – Fourth Revised Edition (2005), Sultan Chand & Sons. ***Chapters 6,7,8,11,12***

Reference Books:

Fundamentals of computers - I.V. Rajaram, II Edition, Prentice Hall of India Pvt.Ltd.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER – III (A) **INTRODUCTION TO MICROCONTROLLER 8051**				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III		**6**	**5**	**100**

Objectives:

To be able to

- *gain the knowledge in INTEL 8051*
- *gather information about 8051 instruction set*
- *have a brief knowledge of programming techniques*
- *improve the knowledge about interfacing unit*

Unit I: Architecture of the INTEL 8051

Introduction – Historical background – Microprocessors versus Microcontrollers – On chip oscillator and CPU timing – Memory organization – Register organization – Multifunction I/O ports – ALU capability of 8051 – Reset operation – Interrupt structure – The 8051 family

Unit II: 8051 Instruction set

Instruction formats – Addressing modes – Organization of the instruction set – Data transfer group

Unit III: 8051 Instruction set

Logic group - Arithmetic group – Control transfer group

Unit IV: **Assembly Language Programming**

Simple sequence programs – Multi byte addition – Code conversion – Binary to BCD code conversion – Program looping – Multi byte addition – check sum byte calculation – Delay generation – Searching - Sorting

Unit V: **Interfacing for Human Interaction**

Interfacing of DIP switches – Keyboard – Interface circuit – Interfacing of display devices – Single LEDs – Bi-colour LEDs – Seven segment LEDs – Interfacing multiple seven segment LEDs

Text Book

Microcontrollers: Principles and application By Ajit Pal, PHI learning Limited, New Delhi, 2011

Unit I – Section 1.1, 1.2, 2.1 to 2.8

Unit II – Section 3.2 to 3.4.1

Unit III – Section 3.4.2 to 3.4.4

Unit IV – Section 4.4 to 4.4.3, 4.5 to 4.5.5

Unit V – Section – 7.1 to 7.2.1, 7.3 to 7.3.4

Reference Books

1. *Microprocessors and Micro controllers - A. Nagoor Kani*
2. *The 8051 Microcontroller and Embedded systems using Assembly and C By Kennet J. Ayala and Dhananjay V. Gadre*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER III (B) NANOPHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III	**R6EPY6**	**6**	**5**	**100**

Objectives:

To be able to

- *Gain some basic ideas in nano scale*
- *Grasp structure and properties of CNTS.*
- *Rejuvenate various methods of synthesizing nano crystalline powder*
- *Compare the properties of bulk and nano systems*

Unit I Properties of materials

Size dependent properties – Crystal structure – Energy band – Magnetic property – Electron related chemical property – Colloids – Concepts of nanomaterials

Unit II Quantum Mechanical aspects

Simulation of the properties of molecular clusters – Formation of energy gap – preliminary aspects of lithography – confinement effects – Discreteness of energy levels – Evaluation of future prospects.

Unit III Synthesis of nanomaterials (Chemical &Physical approach)

Physical Vapour Deposition – Chemical Vapour Deposition – Pulsed Laser Deposition – Ball milling

Solgel – LB film – Self assembly – clusters – Electro deposition – Nanoparticles through homogeneous solution – Nanoparticles through heterogeneous solution.

Unit IV Characterization technique

X-ray powder diffraction -Spectroscopy (UV-Vis, FTIR, Raman spectroscopy) Scanning Electron Microscopy (SEM) – Photoemission and X-ray spectroscopy6 – Thermo Gravimetric Analyses – Differential scanning calorimetric – Differential Thermal Analyses – VSM.

Unit V Application of nanomaterials

Quantum device: Quantum well, Quantum dots – Photo electrochemical cell – Sensors– Fundamentals of Microelectromechanical (MEMs) – nano electromechanical system (NEMs)

Text Books:

1. *Introduction to solid state physics – C. Kittel, Wiley – Interscience, 1996*
2. *Introduction to Nanotechnology – Charles P. Poole jr and Franck J. Ownes, Wiley India Pvt. Ltd., 2007*
3. *Nanotechnology and Nanoelectronics – W. R. Fahrner – springer , 2006*
4. *Nanostructures and Nanomaterials – Guozhang Cao, Imperial College Press., 2004*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XII- SOLID STATE PHYSICS – II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S6CPY10**	**6**	**4**	**100**

Objectives

To be able to:

- *understand the occurrence of superconductivity*
- *know about the consequences of dislocation and point defects*
- *compare the behavior of electrons in gases*
- *have a clear idea about Nuclear Magnetic Resonance*

Unit I Plasmons, Polaritons and Polarons

Dielectric function of the electron gas – longitudinal plasma oscillations – Plasmons-Electrostatic screening – Screened coulomb potential – Mott transition-screening and phonons in metals – Polaritons and LST relation – Electron – Electron transition - electron – phonon interaction – Polarons – Peierls instability – Kramers Krong dispersion relations – Frenkel and Mott Wannier excitions – Exciton condensation – Raman effect in crystals

Unit II Superconductivity

Superconductivity occurrence and its destruction by magnetic fields – Meissner effect – Heat capacity-energy gap – Micro wave and infra red properties and isotope effect- stabilization energy of a superconductor – London theory of Meissner effect – Coherence length – Basic ideas of BCS theory – Flux Quantization – Type II superconductors and vortex state – Single particle tunneling – DC and AC Josephson effects – Macroscopic quantum interference – High temperature superconducting (HTC) materials

Unit III Diamagnetism, Para magnetism, Ferro and Anti Ferro magnetism

Langevin diamagnetism equation – Quantum theory of dia magnetism – Quantum theory of Para magnetism – Hund's rules – Crystal field splitting and Quenching of orbital angular momentum – Spectroscopic splitting factor – Van vleck temperature independent Para magnetism – Ferromagnetism: Curie point – Weiss molecular field theory – Saturation magnetization – Quantization of spin waves (Magnons) and thermal excitation of Magnons-Ferromagnetism and antiferromagnetism

– Neel temperature – Ferro magnetic domain walls and origin of domains – Coercivity and hysteresis

Unit IV Magnetic Resonance and Point defects

Nuclear magnetic Resonance: Bloch equations and power absorption –Motional Narrowing – Electron paramagnetic resonance and paramagnetic defects – Point defects – Schottky defects – Frenkel defects – Diffusion in metals – f centers

Unit V Surface, Interface Physics and Dislocations

Reconstruction and relaxation-Surface crystallography – Work function – Thermionic emission – Surface states and tangential surface transport – Quantum Hall effects – IQHE and FQHE - PN junctions – Rectifications – Solar cells and photo voltaic detectors – Phenomenon of slip Edge and screw dislocation – Burgers vectors – Stress fields of dislocations

Text Book

Introduction to solid state Physics - C.Kittel, (VII Edition) 1995, John Wiley & Sons

Chapters 10 to 12, 14 to16, 18 to 20

Reference Books

1. Solid State Physics - P.K. Palanichamy, Fourth Reprint Nov 2004, Scitech Publications (India) Pvt.Ltd

2. Solid State Physics – Gupta. Kumar, Fifth Edition, K.Nath & Co.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XIII- MOLECULAR SPECTROSCOPY				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S6CPY11**	**6**	**4**	**100**

Objectives

To be able to

- *understand the principles of the spectroscopy*
- *have a detailed knowledge of the different regions of the electromagnetic spectrum*
- *understand the elements of molecular modeling*
- *understand the use of different data structures.*

Unit I Microwave Spectroscopy:

The Rotation of Molecules-Rotational Spectra – Diatomic Molecules – Polyatomic molecules – Techniques and Instrumentation – Chemical Analysis by Microwave Spectroscopy

Unit II Infrared Spectroscopy:

The vibrating Diatomic molecule – The Diatomic vibrating Rotator- The vibration-Rotation spectrum of Carbon monoxide- Breakdown of the Born-Oppenheimer Approximation: The Interaction of Rotations and vibrations- The vibration of Polyatomic molecules- The Influence of Rotation on the spectra of Polyatomic molecules- Analysis by Infrared Techniques- Techniques and Instrumentation

Unit III Raman Spectroscopy

Introduction – Pure Rotational Raman Spectra-Vibrational Raman spectra – Polarization of light and the Raman Effect – Structure Determination from Raman and infrared Spectroscopy-Techniques and Instrumentation – near Infrared FT Raman Spectroscopy

Unit IV Electronic Spectroscopy of Molecules:

Electronic Spectra of Diatomic molecules: The Born Oppenheimer Approximation – Vibrational coarse structure: Progressions-Intensity of Vibrational-Electronic Spectra; the Franck Condon Principle-Dissociation Energy and dissociation products – Rotational fine structure of electronic vibration transitions – the Fortrat diagram – Pre dissociation.

Unit V Spin resonance Spectroscopy:

Spin and an applied field – Nuclear magnetic resonance spectroscopy: Hydrogen nuclei –Nuclear magnetic resonance spectroscopy: Nuclei other than Hydrogen - Techniques and instrumentation

Text Book

Fundamentals of Molecular Spectroscopy – C.N. Banwell and Elaine M. Mc Meas- Fourth Edition, Tata Mc Graw-Hill

Unit I – Chapter 2 – 2.1 to 2.6

Unit II – Chapter 3 - 3.1 to 3.8

Unit III – Chapter 4 – 4.1 to 4.7

Unit IV – Chapter 6 – 6.1.1 – 6.1.7

Unit V – Chapter 7 – 7.1-7.4

Reference Books

1. *Spectroscopy by Gurdeep R., Chatwal Sham K. Anand, Himalaya Publishing House*
2. *Spectroscopy by H. Kaur, Pragati Prakashan*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XIV- QUANTUM MECHANICS II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV		**6**	**4**	**100**

Objectives

To be able to

- *understand the quantum concepts.*
- *appreciate the development of wave mechanics*
- *understand the approximation methods*
- *appreciate the basic concepts of scattering theory*

Unit I Approximation Methods for stationary states

Equations in various orders of perturbation theory-The non degenerate case – The degenerate case - Removal of degeneracy – The effect of an electric field on the energy levels of an atom (Stark effect) – Two electron system

Unit II Variation Method and WKB approximations

Upper bound on ground state energy – Application to excited states – Trial function linear in variational parameters – Hydrogen molecule – **The WKB approximation:** The one dimensional Schrodinger equation – The Bohr-Sommerfeld quantum condition – WKB solution of the radial wave equation

Unit III Relativistic Wave Equations:

Generalization of Schrodinger equation- The Klein-Gordon equation Plane wave solutions; Charge and current densities- Interaction with Electromagnetic Fields; Hydrogen like Atom – Nonrelativistic Limit.

Dirac's Relativistic Hamiltonian- Position probability Density; expectation values- Dirac Matrices-Plane wave solutions of the Dirac equation; energy spectrum-Spin of the Dirac Particle- Significance of Negative energy states; Dirac particle in Electromagnetic Fields .

Unit IV Scattering theory

Kinematics of the scattering process: differential and total cross section – Wave mechanical picture of scattering: the scattering amplitude – Green's functions; formal expression scattering amplitude – The born approximation – validity of the Born approximation

Unit V Partial Wave Analysis

Asymptotic behavior of Partial waves: Phase shifts-Scattering amplitude in terms of Phase Shifts Phase Shifts: Relation to the potential- Potentials in finite range- low Energy Scattering -Scattering by a square well potential – Scattering by a hard sphere

Text Book

1. A Text Book of Quantum Mechanics – P.M. Mathews and Venkatesan, , Tata McGraw-Hill Publishing Company Limited, Seventh Reprint (2000)

Unit I – Chapter 5.5 to 5.5

Unit II – Chapter 5.6 to 5.9, 5.11 to 5.13

Unit III – Chapter 10.1 to 10.10

Unit IV – Chapter 6.1 to 6.5

Unit V – Chapter 6.8-6.9 and 6.11 to 6.15

Reference Books*:*

1. Quantum Mechanics – Leonard I. Schiff, Third Edition, International student edition.

2. Quantum Mechanics – Gupta Kumar Sharma, Twenty sixth edition, Jai Prakash Nath &Co, Meerut (2007).

3. Quantum Mechanics – V. K. Thankappan, Second edition, Wiley eastern Ltd.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	SELF STUDY PAPER – IV FIBRE OPTIC COMMUNICATION				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S6SPY4**		**3**	**100**

Objectives

To be able to

- *understand the principles of optic fibre*
- *have a detailed knowledge of the different mode of propagation*
- *understand the elements of fibre fabrication*
- *understand the attenuation in fibre*

Unit I

Optic fibres – Importance of Optical fibres – Propagation of light waves in an optical fibre – Basic structure of an optical fibre and propagation of light wave through it – Acceptance angle and acceptance core of a fibre – Numerical aperture (general) – Numerical aperture of a graded index fibre

Unit II

Mode of propagation – Meridional and Skew rays – Numbering modes and cut – off parameters e.g. Fibres – single mode propagation – Comparison of step and graded index fibres – Application of fibres – Fibres classification – Stepped index fibre – Stepped – Index monomode fibre – Disadvantage of monomode fibre – Graded index multimode fibre – Plastic fibres.

Unit III

Fibre fabrication – External CVD –Axial Vapour Deposition (AVD) – Internal Chemical Vapour Deposition (IVCD) – Characteristics of all these methods – Fibre drawing and coating – Double – Crucible method

Unit IV

Attenuation in optic fibres – Material loss – Absorption loss – Leaky modes – Bending losses radiation induced losses – Inherent defect losses – inverse square law losses – Transmission losses – Temperature dependence of fibre losses – Core and cladding losses

Unit V

Dispersion in optical fibres – inter model dispersion – Mixing of modes – Material chromatic dispersion – Wave guide dispersion – dispersion power penalty – Total display delay – Maximum transmission rate

Text Books:

1. *Optical fibres and fibre optic communication systems – Subir Kumar Sarkar Fourth revised edition. S. Chand & Company Ltd.*
2. *Introduction to Fibre Optics – Ajoy Ghatak and K. Thyagarajan.*
3. *Semiconductor Opto Electronics – Bhattacharya P. PHI. New Delhi*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER – IV (A) OPTO ELECTRONICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV		**6**	**5**	**100**

Objectives

To be able to

- *Learn about lasers*
- *Understand concept of holography*
- *study optical fiber waveguides*
- *analyse the concepts of nonlinear optics*

Unit I Basic Principles of laser:

Population Inversion – Laser Pumping – Resonators – Vibrational modes of a resonator – Number of modes per unit volume – Open resonators – Confocal resonator – Quality factor Q – Losses inside the cavity – The threshold condition – Quantum Yield.

Unit II Types of laser: Solid State Lasers: The Ruby laser-a three level system – Gas lasers – Neutral atom gas lasers: Helium-neon laser – Liquid – Dye and Chemical lasers – Molecular gas lasers.

Applications of lasers: Some experiments of fundamental importance – Ether Drift – Absolute rotation of Earth – Counting of atoms – Isotope Separation – Plasma – Thermonuclear Fusion – lasers in chemistry – Communication by Laser – ranging atmospheric optics – Lasers in astronomy – Lasers in Biology – Lasers in Medicine – Lasers in industry.

Unit III Optical Fibre:

Introduction – Physical Nature of optical fibre – Basic Principle involved in optical fibre technology – Fibre classification – Fibre Attenuation (losses) – Advantages/Disadvantages of using optical fibre as communication medium – Various application areas of optical fibre.

Unit IV Holography:

Introduction to Holography – the basic principle – Coherence requirement – Resolution – Fourier transform hologram – Volume holograms – Applications – microscopy interferometry – Character recognition

Unit V Non-linear optics:

Harmonic generations – Second Harmonic generation – Phase matching – Third harmonic generation – Optical mixing – Parametric generation of light – Self-focusing of light.

Text Book

1. Lasers and Non-Linear Optics - B.B.Laud – Second Edition (Reprint 2006),

Unit I – Chapter 6 – 6.1 to 6.11,

Unit II – Chapter 7, 8, 10, 17 – 7.1, 8.1, 8.5, 10.1 to 10.3, 17.1 to 17.15

Unit V – Chapter 13 – 13.1 to 13.7.

2. Optical Fibre and Laser Principles and Applications - Anuradha De – I Edi Reprint 2005

Unit III – Chapter 2 – 2.1 to 2.12

3. Optical Electronics –Ajay Ghatak, K. Thiagarajan – seventh reprint 2006

Unit IV – Chapter 7 – 7.1 – 7.7

Reference Book

1. Engineering physics-I - C. Thenmozhi , Hi-Tech Publications, I edition, 2004

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	ELECTIVE PAPER – IV (B) CRYSTAL GROWTH AND THIN FILM				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV		**6**	**5**	**100**

Objectives

To be able to

- understand the physics of crystal
- learn growth phenomena
- understand thin film concepts
- apply in various fields

UNIT I Introduction to Crystal Growth

The historical development of crystal growth-significance of single crystals-reasons for growing single crystals- crystal growth techniques- the chemical physics of crystal growth

UNIT II Crystal Growth Phenomena

Introduction- nucleation - theories of nucleation- classical theory of nucleation-modified Thomson's equation for melt – Gibbs-Thomson equation for solution – energy of formation of a nucleus- spherical nucleus- cylindrical nucleus- heterogeneous nucleation- cap-shaped nucleus-disc shaped nucleus- kinetics of crystal growth- singular and rough faces

UNIT III Some Growth Techniques

Pre- amble- growth from melt- the Bridgeman and related techniques- crystal pulling- advantages and disadvantages – the crystal pulling technique- solution growth-low temperature solution growth- crystal growth system- seed preparation- high temperature solution growth.

UNIT IV Thin Film

Nature of thin film-deposition technology- thermal deposition in vacuo – kinetic theory of gas and emission condition – distribution of deposit – electron beam method – cathodic sputtering – glow discharge sputtering – low pressure sputtering – reactive sputtering – R.F. sputtering – chemical vapour deposition or vapour plating- chemical deposition- electrodoposition – anodic oxidation – electroless plating – deposition by chemical reaction – chemical displacement

Unit V Some Technological Applications

Introduction – discrete resistive components – resistors – carbon films – oxide and nitride films – cermet films – metal films – thermistor, varistor, strain gauge element, etc – capacitor – hall probe element – active devices – micro-electornics, integrated circuits and other applications

Textbooks:

1. *Crystal growth processes and methods by P. SanthanaRaghavan and P. Ramasamy KRU publications*

Unit I – Sec 1.1 to 1.5

Unit II – Sec 2.1, 2.2 (full), 2.3(2.3.1 and 2.3.2)

Unit III – Sec 3.1, 3.2, 3.3, 3.4(full), Sec 4.1, 4.2, 4.7, 4.8

2. *Thin film fundamentals by A. Goswami, New Age international (P) Ltd 2014.*

Unit IV – Sec 2, 3(3.1to3.3), 5, 6(6.1to 6.4), 7, 8(8.1 to 8.5)
Unit V – Sec 1 to 7

Reference book:

1. Materials Science of thin films By Milton Ohring.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	CORE XV- GENERAL PHYSICS - PRACTICAL - III				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S6CPYL3**	**4**	**6**	**100**

ANY TWELVE

1. Quinke's method - Susceptibility of ferroelectric material.
2. Hall Effect
3. Brewster angle
4. Edsor Buttler fringes
5. Resolving power of prism
6. Determination of band gap using UV- NIR absorption spectra
7. B-H Curve Tracer
8. Multibyte addition, binary to BCD conversion, searching using microcontroller 8051.
9. Interfacing of DIP switches- single LED-bicolor LED- seven segment LED using microcontroller 8051.
10. Susceptibility of the given liquid – Guoy's Balance
11. Ultrasonic Interferometer – Compressibility of the given liquid
12. Thickness of single slit using laser diffraction
13. Identification of planes using diffraction pattern
14. Laurent's Half shade polarimeter

POST GRADUATE PROGRAMME IN PHYSICS

(For those who joined 2018– 2019 onwards under CBCS pattern)

Sem	*Subject*	*Subject Code*	*Title of the Paper*	*Remarks*
I	CORE	P6CPYI	Mathematical Physics-I	NO CHANGE
		P6CPY2	Classical Mechanics	NO CHANGE
			Applied Electronics	NO CHANGE
		Q6CPYL1	* Practical –I Electronics	NO CHANGE
		Q6CPYL2	*Practical-II General Experiments	NO CHANGE
	#SSP	P6SPY2	Communication System	NO CHANGE
	ELECT. I	P6EPY1	Programming in C++	NO CHANGE
		P6EPY2	Numerical Methods	NO CHANGE
II	CORE	Q6CPY4	Mathematical Physics-II	NO CHANGE
		Q6CPY5	Thermodynamics and Statistical Mechanics	NO CHANGE
		Q6CPY6	Electromagnetic theory	NO CHANGE
		Q6CPYL3	Practical –I Electronics	NO CHANGE
		Q6CPYL2	Practical-II – General Experiments	NO CHANGE
	#SSP	Q6SPY3	Bio Medical Instrumentation	NO CHANGE
	ELECT. II	Q6EPY3	Instrumentation	NO CHANGE

		Q6EPY4	Medical Physics	NO CHANGE
III	CORE	R6CPY7	Solid State Physics - I	NO CHANGE
			Quantum Mechanics -I	NO CHANGE
		R6CPY9	Nuclear Physics	NO CHANGE
		S6CPYL3	*Practical-III General Physics	NO CHANGE
		S6CPYL4	*Practical – IV -Project	NO CHANGE
	#SSP		Information Technology	NO CHANGE
	ELECT. III		Introduction to Microcontroller 8051	NO CHANGE
		R6EPY6	Nanophysics	NO CHANGE
IV	CORE	S6CPY10	Solid State Physics - II	NO CHANGE
		S6CPY11	Molecular Spectroscopy	NO CHANGE
			Quantum Mechanics -II	To be Modified (some portions have been included)
		S6CPYL4	*Practical – III General Physics	NO CHANGE
		S6CPYP	*Practical – IV Project	NO CHANGE
	#SSP	S6SPY4	Fiber optic communication	NO CHANGE
	ELECT.IV		optoelectronics	NO CHANGE
			Crystal growth and thin film	NO CHANGE

UNDER GRADUATE PROGRAMME IN PHYSICS

For those who joined 2018 – 2019 onwards under CBCS pattern

Ancillary for Maths & Chemistry Majors

Semester	Subject Code	Title of the paper	Hours		Credits	Marks			Page No
			Teach.	Exam		Int	Ext	Total	
I		Fundamental Physics	3	3	2	25	75	100	47
		*Practical – I	2						
II	Q3APY2	Heat &Thermodynamics	3	3	2	25	75	100	49
	Q3APYL1	Practical – I	2	3	1	40	60	100	51
III		Electricity & Basic Electronics	3	3	2	25	75	100	52
		*Practical – II	2						
IV		Modern Physics &Optics	3	3	2	25	75	100	54
	S3APYL2	Practical –II	2	3	1	40	60	100	56

***Exams conducted only at even semester**

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER I - FUNDAMENTAL PHYSICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	I		**3**	**2**	**100**

Objectives

To be able to

- *acquire the basic knowledge about mechanics.*
- *understand the concept of Moment of Inertia.*
- *gather interesting information about artificial satellites.*
- *understand the various properties of matter.*

Unit I

Impulse-impact –fundamental principles of impact- oblique impact of smooth sphere on a fixed smooth plane – final velocity and loss of kinetic energy in the case of direct and oblique impact of two smooth spheres –rocket motion- principle and expression for thrust and velocity –specific impulse- multistage rocket

Unit II

Angular velocity – normal acceleration (no derivation) – centrifugal and centripetal forces – torque and angular acceleration – work and power in rotational motion – angular momentum – K.E of rotation –moment of inertia – laws of parallel and perpendicular axes theorems – M. I. of circular ring, circular disc, solid sphere, hollow sphere and cylinder

Unit III

Kepler's laws of planetary motion – law of gravitation – Boy's method for G – compound pendulum – expression for period – experiment to find g – variation of g with latitude, altitude and depth – artificial satellites

Unit IV

Elastic moduli – Poisson's ratio – beams – expressions for bending moment – determination of Young's modules by uniform and non-uniform bending – I section girders, torsion – expression for couple per unit twist – work done in twisting – Torsional pendulum. Derivation of Poiseuille's formula (analytical method) – Bernoulli's theorem – Proof – Applications – Venturimeter – Pitot tube

Unit V

Simple harmonic motion – progressive waves – properties – composition of two S.H.M. and beats – Stationary waves – properties – Melde's experiment – transverse and longitudinal modes – Acoustics – Ultrasonic – Piezo-electric generator – Properties and applications

Text Book:

1. *Mechanics Properties of matter and Sound; Thermal Physics, R.Murugeshan - First Edition (July 2002) – Unit I*
2. *Ancillary Physics - R. Murugeshan, First edition, August 2006 (Units – II, III, IV, V)*

Reference Books:

1. *Mechanics – N.Basu S.Nanda, P.C.Nayak, Copyright1999, Narosa Publication.*
2. *Properties of mater – D. S. Mathur, First Edition (1949), Reprint 2008 – S. Chand & Co*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER II - HEAT AND THERMODYNAMICS			
SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
II	**Q3APY2**	**3**	**2**	**100**

Objectives

To be able to

- *understand the laws of thermodynamics.*
- *study the phenomenon of entropy.*
- *analyse the various methods of heat transfer.*
- *understand the kinetic theory of gases.*

Unit I

Expansion of crystals – determination of α by air wedge – expansion of anisotropic solids – solids of low expansivity and their uses – anomalous expansion of water – thermostat- isothermal and adiabatic changes – derivation of equation for both C_v and C_p of a gas – relation between them – experimental determination of C_v by Joly's method – determination of C_p by Regnault's method

Unit II

Conduction: Lee's disc method for conductivity of bad conductor (air and cardboard) – analogy between heat flow and electric current – Wiedmann – Franz law

Convection**:** convection in atmosphere – lapse rate – stability of atmosphere – green house effect – atmospheric pollution

Unit III

Radiation: Stefan's law – determination of Stefan's constant by filament heating method – solar constant measurement – water flow pyroheliometer – temperature of the sun – solar spectrum – energy distribution in black body spectrum – Planck's Law (No derivation). Derivation of Wien's and Rayleigh Jeans laws from Planck's law

Unit IV

Kinetic theory of gases **-** mean free path –transport phenomena – diffusion, viscosity and thermal conductivity – Maxwell's law of distribution of molecular speed (No derivation) – experimental verification – degree of freedom – Boltzmann's law of equipartition of energy – calculation of "γ" for mono atomic and diatomic gases

Unit V

Thermodynamics: Carnot's theorem - efficiency – second law of thermodynamics – entropy – changes of entropy in Carnot's cycle – change of entropy in conversion of ice into steam - JK effect – simple theory of porous plug experiment – adiabatic demagnetization – Curie's law – superconductivity

Text Book:

Ancillary Physics - R. Murugeshan, First Edition September (2007).

Reference Books:

Heat and Thermodynamics - Brijlal & N. Subramaniyam – fifteenth Edition (1993) S. Chand & Co

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER III - PRACTICAL-I				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	II	**Q3APYL1**	**2**	**1**	**100**

ANY FIFTEEN EXPERIMENTS

1. Young's modulus – Uniform Bending – Pin and microscopic method
2. Potentiometer – Low range voltmeter calibration
3. Young's modulus – Uniform Bending – optic lever method
4. B.G – Comparison of emf
5. Compound pendulum – 'g' and radius of gyration
6. Estimation of errors
7. Searle's apparatus -q, n, σ
8. Newton's law of cooling
9. Young's modulus – Non Uniform Bending – Optic lever method
10. Torsion pendulum –G and I
11. Young's modulus – Non-Uniform Bending - Pin and microscopic method
12. Potentiometer – Ammeter calibration
13. Potentiometer – Resistivity and resistance
14. Melde's string – Frequency
15. B.G – Comparison of Capacitance
16. Lee's disc – Thermal conductivity of cardboard
17. Sonometer – Laws verification

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER IV - ELECTRICITY AND BASIC ELECTRONICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	III		**3**	**2**	**100**

Objectives

To be able to

- *understand the various concepts of Electricity*
- *gain knowledge about semi conducting devices*
- *solve the logical equations using Boolean algebra*
- *apply boolean algebra to design logic circuits*

Unit I Static and Current Electricity:

Coulomb's Law – electric field – electric field due to a point charge- flux of the electric field - Gauss law (No proof) – Application – Field due to a charged sphere– Coulomb's theorem – Electric potential – Relation between potential and field – capacitors – Expression for C of parallel plate capacitor- capacitance of a parallel plate capacitor partly filled with a dielectric slab – Energy stored in a charged capacitors

Kickoff's laws – applications of Kirchhoff's law to whetstone's network- Carey Foster Bridge –Measurement of resistance and temperature co- efficient of resistance

Unit II Magnetic Effect:

Torque on a current loop – Mirror galvanometer, dead beat and ballistic – Current sensitiveness – Experiment – Charge sensitiveness – Damping – Damping correction – Experiment for charge sensitiveness – Comparison of emfs and comparison of capacitors

Unit III Alternating Current:

E.M.F. generated in a coil rotating in a uniform magnetic field – R.M.S. and mean values – LCR circuit – Impedance – Series and parallel resonant circuits – Applications – Power factor – Wattless current – Choke

Unit IV Basic Electronics:

Junction diodes – Forward and reverse bias – Diode characteristics – Types of diodes – (LED and Zener) – Bridge rectifier using junction diodes – Π filter – Transistors – characteristic (CE mode only) – Hartley oscillator – Modulation (qualitative study) – Op-Amp and its characteristic – Virtual earth – Voltage amplifier in inverting mode – Op-amp as adder and subtractor

Unit V. Number System and Logic circuits:

Binary number system – Reason for using binary numbers – Binary to decimal and decimal to binary conversions – Addition and subtraction of binary numbers. Boolean algebra – De Morgan's theorem – Inverters OR, AND, NOR and NAND gates – NOR and NAND gates as universal building blocks –XOR gate

Text Book

Ancillary Physics - R. Murugesan First edition June 2011.

Reference Books

1. *Basic Electronics – B. L. Theraja S.Chand & Co, reprint 2005*
2. *Electricity and magnetism – Brijilal & N. Subramaiyam – S. Chand & Co*

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER V - MODERN PHYSICS AND OPTICS				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV		**3**	**2**	**100**

Objectives

To be able to

- *understand geometrical optics*
- *gain knowledge about theory of relativity*
- *appreciate the principle of diffraction and polarization*
- *understand fundamentals of spectroscopy*

Unit I Modern Physics:

Quantum Theory: Plank's quantum theory – Raman Effect – Simple theory experimental study (Wood's apparatus) –Photo electricity: Laws of photo electricity – Einstein's equation – Photoelectric cells and their uses, photo emissive, photoconductive and photovoltaic cell – Photon detectors – Fiber – optic communication system. Wave Nature of Matter: de Broglie's theory – Electron diffraction- G. P. Thomson's experiment

Unit II Relativity:

Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation equations (No derivation) Length contraction – Time dilation – Variation of mass with velocity and mass – Energy relation (simple derivation)

Unit III Geometrical Optics:

Derivation produced by thin film lens – Focal length of two thin lenses in and out of contact – Cardinal points – Refraction through a thin prism – Dispersions – Dispersive power – Combination of thin prism to produce 1.Deviation without dispersion and 2. Dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses and its removal – Spherical aberration and its removal – Aplanatic surfaces – Theory of primary and secondary rainbows

Unit IV Physical Optics:

Interference: Interference in thin films – Air wedge – Newton's ring (Reflected beam only) – Determination of wavelength – Jamin's Interferometer, principle and use. Diffraction: Theory of plane transmission grating (Normal incidence only) – Experiment to determine wavelengths. Polarization: Double refraction – Nicol prism, construction, action, and uses – QWP and HWP – Optical activity (No theory) – Biot's laws – Specific rotatory power – Half shade polarimeter – Determination of specific rotatory power

Unit V. Spectroscopy:

Infrared radiations, production, properties and uses – Ultraviolet radiations, sources, properties and used – Laser: Induced absorption, spontaneous emission and stimulated emission – The Ruby laser – Helium-neon laser –Properties of a laser beam

Text Book

1. Ancillary Physics – R. Murugeshan, First edition January 2011

Unit *I to V*

2. Modern Physics, R. Murugeshan – S. Chand & Company LTD, Eleventh (Revised) Edition (2003).

Unit *V* – Chapter 19 – 19.1 to 19.5

Reference Books

1. Modern Physics - R. Murugeshan, S. Chand & Company LTD, Eleventh (Revised) Edition 2003
2. A Text Book of Optics by N.Subrahmnanyam, Brijlal, M.N. Avadhanulu, First Multicolor Edition (2006), S.Chand & Company Ltd.,

Applied physics for engineers - Dr. P. Murugakowtham, Dr. S. Sivasankaran & Dr. K. Sadayandi.

DEPARTMENT OF PHYSICS

(For those who joined 2018 – 2019 onwards under CBCS pattern)

	PAPER VI – PRACTICAL II				
	SEMESTER	**CODE**	**HOURS**	**CREDIT**	**MARKS**
	IV	**S3APYL2**	**2**	**1**	**100**

ANY FIFTEEN EXPERIMENTS

1. Sonometer – AC frequency
2. Air wedge – thickness of paper
3. Bridge rectifier – with filter
4. B.G – Voltage and Current sensitivity
5. Logic gates AND, OR, NOT-Discrete components
6. LCR series resonance circuit.
7. Prism- Dispersive Power
8. Microscope – Newton's rings – to find radius of curvature of lens
9. B.G – Charge sensitivity
10. AND, OR, NOT, NAND,NOR logic gates – IC
11. Grating- Normal Incidence
12. Logic gates NAND, NOR- Discrete components
13. LCR – parallel resonance circuit
14. Single stage amplifier – CE mode
15. Hartley Oscillator
16. Op-amp Adder and Subtractor
17. De-Morgan's laws - verification

UNDER GRADUATE PROGRAMME IN PHYSICS

For those who joined 2018 – 2019 onwards under CBCS pattern

Ancillary for Maths & Chemistry Majors

Semester	Subject Code	Title of the paper	Remarks
I		Fundamental Physics	NO CHANGE
		*Practical – I	NO CHANGE
II	Q3APY2	Heat &Thermodynamics	NO CHANGE
	Q3APYL1	Practical – I	NO CHANGE
III		Electricity & Basic Electronics	NO CHANGE
		*Practical – II	NO CHANGE
IV	S3APY5	Modern Physics &Optics	NO CHANGE
	S3APYL2	Practical –II	NO CHANGE

***Exams conducted only at even semester**