DEPARTMENT OF PHYSICS

Aim

To provide physics education of high quality by offering an intellectually stimulating environment in which students have the opportunity to develop their skills to the best of their potential.

Objectives

1. To acquire basic knowledge so that they may be able to pursue higher studies.
2. To develop self study methods and problem solving techniques in students.
3. To record and process data systematically.
4. To sharpen the experimental skills.
5. To develop an appreciation for the inter relation between theory and practical.
6. To inculcate in students the team spirit and leadership qualities.
7. To develop scientific temper.

B.Sc. Physics

Courses Offered

Semester	Course	Subject Code	Paper	Hours per Week	Credits
I	Part I	TL1711 FL1711	Language: Tamil French	6	3
	Part II	GE1711 GE1712	General English: A Stream B Stream	6	3
	Part III	PC1711	Major Core I: Mechanics and Properties of Matter	4	4
		PC17P1	Major Practical I: Physics Lab I	2	-
		AP1711	Allied I: Allied Physics – I (for I B.Sc Maths)	4	4
		AP17P1	Allied Practical: General Physics Lab	2	-
	Part IV	AEC171	Ability Enhancement Compulsory Course (AECC): English Communication	2	2
		PNM171	Non Major Elective Course (NMEC): Everyday Physics I	4	2
		VEC171	Foundation Course I: Value Education - I	-	-
	Part V	SDP172	Skill Development Programme (SDP): Certificate Course	-	-
		STP174	Student Training Programme (STP): Clubs and	-	-

			Committees / NSS		
II	Part I	TL1721 FL1721	Language: Tamil French	6	3
	Part II	GE1721 GE1722	General English: A Stream B Stream	6	3
	Part III	PC1721	Major Core II: Thermal Physics Sound	4	4
		PC17P1	Major Practical I: Physics Lab I	-	2
		PC17P2	Major Practical II: Physics Lab II	2	2
		AP1721	Allied I: Allied Physics - II (for I B.Sc Maths)	4	4
		AP17P1	Allied Practical: General Physics Lab	2	2
	Part IV	AEC172	Ability Enhancement Compulsory Course (AECC): Environmental Studies	2	2
		PNM172	Non Major Elective Course (NMEC): Every Day Physics II	4	2
		VEC172	Foundation Course I: Values for Life	-	1
	Part V	SDP172	Skill Development Programme (SDP): Certificate Course	-	1
		STP174	Student Training Programme (STP): Clubs and Committees / NSS	-	-

III	Part I	TL1731 FL1731	Language: Tamil French	6	3
	Part II	GE1731 GE1732	General English: A Stream B Stream	6	3
	Part III	PC1731	Major Core III: Electricity and Magnetism	4	4
		PC1732 PC1733 PC1734	Elective I: (a) Non Conventional Energy Sources (b) Medical Physics (c) Physics of the Earth	4	4
		PC17P3	Major Practical III: Physics Lab III	2	-
		AP1731	Allied II: Allied Physics - I (for II B.Sc Chemistry)	4	4
		AP17P1	Allied Practical: General Physics Lab	2	-
	Part IV	SBC173/ SBC174	Skill Based Course (SBC): Meditation and Exercise / Computer Literacy	2	2

		VEC174	Foundation Course II: Personality Development	-	-
	Part V	STP174	Student Training Programme (STP): Clubs & Committees / NSS	-	-
		SLP173	Service Learning Programme (SLP): Extension Activity (RUN)	-	1
IV	**Part I**	TL1741 FL1741	Language: Tamil French	6	3
	Part II	GE1741 GE1742	General English: A Stream B Stream	6	3
	Part III	PC1741	Major Core IV: Analog System and Application	4	4
		PC1742 PC1743 PC1744	Elective II: (a) Fibre Optics (b) Microprocessor (c) Communication System	4	4
		PC17P3	Major Practical III: Physics Lab III	-	2
		PC17P4	Major Practical IV: Physics Lab IV	2	2
		AP1741	Allied II: Allied Physics - II (for II B.Sc Chemistry)	4	4
		AP17P1	Allied Practical: General Physics Lab	2	2
	Part IV	SBC173/ SBC174	Skill Based Course (SBC): Meditation and Exercise / Computer Literacy	2	2
		VEC174	Foundation Course II : Personality Development	-	1
	Part V	STP174	Student Training Programme (STP): Clubs and Committees / NSS	-	1
	Part III	PC1751	Major Core V: Element of Modern Physics	6	5

V		PC1752	Major Core VI: Optics	6	5
		PC1753	Major Core VII - Solid State Physics	5	4
		PC1754 PC1755 PC1756	Elective III: (a) Programming with C++ (b) Applied Physics (c) Bio Physics	5	5
		PC17P5	Major Practical V - Physics Lab V	4	-
		PC17P6	Major Practical VI - Physics Lab VI	2	-
	Part IV	PSK175	*SBC: Basic Electrical Circuits and Applications	2	2
		HRE175	Foundation Course III: Human Rights Education	-	1

			(HRE)		
	Part III	PC1761	Major Core VIII: Mathematical Methods of Physics	6	5
		PC1762	Major Core IX: Digital System and Application	6	5
		PC1763	Major Core X: Nuclear Physics	5	4
VI		PC1764 PC1765 PC1766	Elective IV: (a) Nanomaterial and its application (b) Basic Astrophysics (c) Digital Signal Processing	5	4
		PC17P5	Major Practical V: Physics Lab V	-	2
		PC17P6	Major Practical VI: Physics Lab VI	2	2
		PC17P7	Major Practical VII: Physics Lab VII	4	2
	Part IV	PSK176	*SBC – Project	2	2
	Part V	WSC176	Foundation Course IV: Women's Studies (WS)	-	1
			TOTAL	**180**	**140 + 3**

Mechanics and Properties of Matter (Major Core –I)
Subject Code: PC1711

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objective: 1. To impart knowledge on basic aspects of dynamics, conservation laws, kinematics, collisions and elasticity.
2. To acquire skills and practical knowledge in everyday life.

Unit I: Fundamentals of Dynamics

Reference frame – Inertial frames – Newton's laws of motion and its limitations – Galilean transformations – Law of conservation of momentum and energy – Time period and orbital speed of a satellite – Impulse of force – Projectile on inclined plane and down to inclined plane – range and time of flight- Two body problem and reduced mass – Bifilar pendulum - stable, unstable and neutral equilibrium – equilibrium of bodies suspended and supported.

Unit II: Conservation Laws and Kinematics

Conservation laws in general– Concept of work power and energy – Conservative forces – Energy: Work energy principle – Conservative force as negative gradient of potential energy – Curl F=0 – Law of conservation of mechanical energy – Moment of Inertia –Moment of Inertia of a Circular Disc- Moment of inertia of a diatomic molecule – Moment of Inertia of a rectangular block.

Unit III: Collisions and Hydrostatics

Elastic and inelastic Collision – fundamental principles of impact – direct impact of two smooth spheres and its loss of kinetic energy –oblique impact of two smooth spheres and its loss of

kinetic energy – Pressure and thrust- Thrust on a plane immersed in a liquid – center of pressure-center of pressure on a rectangular lamina and triangular lamina- laws of flotation- meta centric height- Equation of continuity- Euler's equation and Bernoulli's theorem.

Unit IV: Elasticity

Moduli of Elasticity – Work done in a strain – Torsion of a body – Torsional oscillations of a body – Bending of beams-Definitions – Expression for the bending moment – Depression of the loaded end of a cantilever –Measurement of Young's Modulus - Uniform and non-uniform bending of a beam.

Unit V: Viscosity and Surface tension

Streamline flow and Turbulent Flow – Poiseuille's formula for the flow of a liquid through a capillary tube – Poiseuille's method for determining coefficient of viscosity of a liquid – Terminal Velocity and Stokes' Formula – Stokes' method for the coefficient of viscosity of a viscous liquid - Explanation of surface tension on Kinetic theory – Drop weight method of determining the surface tension of a liquid – Experiment to determine the interfacial tension between water and kerosene.

Text Books:

1. Mathur, D.S. (1998). *Mechanics*. New Delhi: S. Chand & Company Ltd.
Unit I: 2.3 – 2.6, 2.8, 2.14
Unit II: 5.1 – 5.6, 6.1

2. Murugeshan, R. (2005). *Properties of Matter.* New Delhi: S. Chand & Company Ltd.
Unit II: 7.1, 7.5, 10.6
Unit IV: 1.1 – 1.2, 1.5, 1.9, 1.13 – 1.16, 1.21
Unit V: 2.2 – 2.3, 2.5, 2.8 – 2.9, 3.2, 3.17 – 3.18

3. Murugeshan, R. (2005). *Mechanics and Mathematical Physics.* New Delhi: S. Chand & Company Ltd.
Unit I: 1.1, 2.1, 2.2, 2.4, 2.5, 3.9, 3.10
Unit II: 2.6
Unit III: 1.2, 1.4, 1.5, 4.1-4.5, 5.1, 5.3, 5.4

Reference Books:

1. Robert Resnick, David Halliday. Jearl Walker. (2007). *Fundamentals of Physics*. (10th ed.). USA:Wiley and Sons Inc.
2. Kleppner, D., Kolenkow, R.J. (2014). *An Introduction to Mechanics*.(2nd ed.). UK: Cambridge University Press.
3. Kittel, C., Knight, W. (2007). *Mechanics.* (2nd ed.). USA:Tata McGraw-Hill.
4. Fowles, G.R., Cassiday, G.L. (2005). *Analytical Mechanics.* (7th ed.). USA: Cengage Learning.

Semester I
Major Practical I
Physics Lab – I
Subject Code: PC17P1

No of hours per week	No of credits	Total no of hours	Marks
2	2	30	50

Objective: 1. To understand the basic concepts of properties of matter.

2.To Prove Hook's Law and to determine (i) the elastic constants (Youngs Modulus, Rigidity Modulus and Poisson's Ratio) (ii) Verify the Perpendicular axis theorem, To determine Coefficient of viscosity, Surface tension.

Any six experiments

1. Young's Modulus – Uniform bending – Pin & Microscope
2. Young's Modulus – Non Uniform bending – Scale &Telescope
3. Young's Modulus – Cantilever depression – Pin & Microscope
4. Rigidity Modulus – Torsion Pendulum
5. Verification of perpendicular axes theorem – Bifilar Pendulum
6. Viscosity – Variable pressure head
7. Viscosity – Stoke's Method
8. Surface tension and interfacial surface tension
9. Coefficient of Viscosity of water – Capillary Flow method (Poiseuille's method)
10. Comparison of radii by capillary flow method.
11. Surface tension by capillary rise method.
12. Rigidity modulus by static torsion - Scale &Telescope

Reference Books

1. Squires, G.L. (2015). *Practical Physics.* (4th Ed.), Cambridge University Press.
2. Flint, B. L., H.T. Worsnop. (1971). *Advanced Practical Physics for students*. Asia Publishing House.
3. Michael Nelson., Jon M. Ogborn. (1985). *Advanced level Physics Practicals.* (4th Ed.), Heinemann Educational Publishers.

Semester I/ III

Allied Physics Paper –I
(Common for I B.Sc. Mathematics and II B.Sc. Chemistry students)
(AP1711/AP1731)

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives: 1. To understand the behavior of waves, oscillations, properties of matter and optics.
2. To study the physical concepts behind natural phenomena.

Unit I: Waves and Oscillations: Simple harmonic motion (Definition, Example) - Transverse vibrations of a stretched string – Velocity – Frequency – Laws – Verification using Sonometer - Melde's experiment - A.c. frequency using sonometer – Ultrasonics – Piezoelectric effect – Production of ultrasonic & piezoelectric– Reverberation.
Unit II: Elasticity & Bending moment: Elasticity – Different moduli – Poisson's ratio - Bending of beam – Expression for the bending moment – Young's modulus by non-uniform bending — Torsion pendulum - Determination of rigidity modulus.
Unit III: Viscosity & Surface tension: Streamline flow & turbulent flow - Coefficient of viscosity – Definition - Determination – Poiseuille's formula – Terminal velocity – Stoke's law – Determination of Viscosity of highly viscous liquid - Surface tension: Excess of Pressure inside a drop and bubble – Jaegar's Method.
Unit IV: Physical Optics: Interference – Interference in thin film – Production of colors of thin films – Air wedge – Test for optical flatness – Diffraction – Plane transmission diffraction grating – Determination of wavelength of light using transmission grating – Polarization: polarization by reflection – Double refraction – Nicol prism - Optical activity – Specific rotatory power.
Unit V: Geometrical Optics: Refraction of light – Refraction through prism - Refraction through thin prism – Dispersion through a prism – Expression for dispersive power - Combination of two prisms to produce dispersion without deviation and deviation without dispersion – Direct vision spectroscopy.

Text Book:

Murugeshan. R, (2016). Allied Physics Paper I & II, New Delhi:S. Chand & company Pvt Ltd.
UnitI : Chapter 1: 1.1,1.5-1.13,1.15
Unit II : Chapter 2: 2.1,2.2,2.3,2.5,2.6,2.8,2.12,2.13
Unit III : Chapter 2: 2.14,2.15,2.16,2.17,2.20,2.21,2.22,2.24,2.27,2.28,2.29
Unit IV : Chapter 6: 6.2,6.3,6.4,6.5,6.6,6.8,6.10,6.11,6.12,6.13,6.14,6.16,6.17,6.19
Unit V : Chapter 5: 5.1,5.6,5.10,5.11,5.12,5.13,5.14

Reference Books:

1. Brijilal, Subramanyam, N. (1985). Properties of Matter. (Fourth Ed.), New Delhi: Eurasia Publishing House Pvt. Ltd.
2. Robert F. Kingsbury. (1966). Elements of Physics. (First Ed.) , London: Van Nostrand Company Inc.
3. Ubald Raj, A., Jose Robin. G. (2012). Allied Physics. Indira Publications, Marthandam.
4. Bhargava, N.N., Kulshreshtra,D.C., Gupta,S.C. (1984). Basic Electronics and Linear Circuits. (Sixteenth Ed.), New Delhi: Tata McGraw-Hill publishing Co.

Semester I or III

Allied Practical – General Physics Lab
Subject Code: (AP17P1/AP17P3)
(Common for I B.Sc Mathematics and II B.Sc Chemistry students)

No of hours per week	No of credits	Total no of hours	Marks
2	2	60	100

Objective:

1. To elucidate theory through simple experiments in physics.
2. To make the students more innovative, inhands on experiments.

Any twelve experiments

1. Uniform bending – Optic Lever
2. Non- Uniform bending – Microscope
3. Newton's law of cooling – verification
4. Specific heat capacity of liquid – cooling
5. Thermal conductivity – Lee's Disc
6. Compound Pendulum – to find g
7. Torsion Pendulum – Rigidity modulus
8. Comparison of viscosities of two liquids-Burette method
9. Surface tension and Interfacial surface tension –Drop weight method
10. Spectrometer – Dispersive power
11. Spectrometer- Grating normal incidence
12. Newton's Rings – R and n
13. Air wedge – thickness of a wire
14. Carey Foster Bridge – Specific resistance
15. Calibration of voltmeter – Potentiometer
16. LCR series Resonance Circuit
17. Logic gates – AND, OR, NOT
18. AC frequency – Sonometer
19. LCR – Parallel Resonance circuit.
20. Characteristics of Zener diode

Reference: Manual prepared by the department of Physics, Holy Cross College, Nagercoil.

Semester I
Non Major Elective Course
Everyday Physics – I – PNM171

No of hours per week	No of credits	Total no of hours	Marks
4	3	60	100

Objective: 1. To introduce the basic concepts in physics and their applications in everyday life.
2. To Know how physics is applied in day to day life situations.

Unit I: Mechanical Objects

High-Flying Balls – Bicycles - Tricycles and Static Stability - Bicycles and Dynamic Stability - Leaning While Turning – Pedaling Bicycles - Rockets and Space Travel - Rocket Propulsion - The Ultimate Speed of a Spacecraft - Orbiting Earth - Orbiting the Sun: Kepler's Laws – Travel to the Stars: Special Relativity.

Unit II: Fluids and Motion

Air and Air pressure- Pressure, density and temperature - Earth atmosphere - Lifting force of a balloon - Water's viscosity- Flow in a straight hose - Bent hose - Flow through a nozzle - Turbulence - Laminar airflow - Turbulent airflow.

Unit III: Heat and Thermodynamics

Heat and temperature – Heat moving through metal – Heat moving with air – Heat moving as light – warming the room – Water, steam and ice – Phases of matter – Melting ice and freezing ice – Evaporating water and condensing steam – Relative humidity – Subliming ice and depositing steam – Boiling water – Earth's temperature and the Green house effect – Air conditioners – Moving heat around

Unit IV: Electricity

Static electricity – Coulomb's law – Uses of static electricity – Pollution control – Smoke stacks – Air freshener – Photocopier – painting cars – Electric current- Theory of electricity – Heating effect of electricity – Application of heating effect - Toaster – Flash lights – Electric bell – How batteries work - How electricity delivers energy – Promising energy for the future.

Unit V: Modern Physics

Nuclear Weapons- The Nucleus and Radioactive Decay - Fission and Fusion - Chain Reactions and the Fission Bomb - The Fusion or Hydrogen Bomb - Radiation and Radioactivity - Nuclear Reactors - Nuclear Fission Reactors Fission Reactor Safety and Accidents -X-Rays - Making X-Rays - Using X-Rays for Imaging.

Text Book:

1. Louis A. Bloomfield. (2013). *How Things Work The Physics of Everyday Life.* (Fifth Ed.), United States America: The Wiley.
   Unit I: Chapter 4: 4.1, 4.2
   Unit II: Chapter 6: 6.1 – 6.3
   Unit III: Chapter 7: 7.1 – 7.3, Chapter 8: 8.1, 8.2
   Unit IV: Chapter 10: 10.1 – 10.3
   Unit V: Chapter 15: 15.1 – 15.3

Reference Books:

1. BrijLal, Subramaniam. (2008). *Heat and thermodynamics,* S. Chand & Company Ltd.
2. Arthur Beiser. (2006). *Concepts of Modern Physics*. (6^{th} Ed.), Tata McGraw-Hill

Semester II
Thermal Physics and Sound (Major Core –II)
Subject Code: PC1721

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives:

1. To introduce the concepts of the kinetic theory of gases along with some of its applications.
2. To understand the laws of thermodynamics, Thermodynamic Potentials, Transmission of heat, Acoustics and Ultrasonics.

Unit I: Kinetic theory of Gases

Kinetic model – Expression for the pressure exerted by a gas – Kinetic energy per unit volume of a gas –Maxwell's law of Equipartition of Energy – Relation between molar specific heat and degrees of freedom – Specific heats of mono and diatomic gases – Mean free path – Expression for mean free path – Transport phenomena – Viscosity – Thermal conductivity – Self diffusion - Maxwell's velocity distribution law – Experimental verification of Maxwell's law.

Unit II: Laws of Thermodynamics

Thermodynamic systems – Zeroth law of thermodynamics – Internal energy - First law of thermodynamics –Application of First law of thermodynamics – Specific heat of a gas - Isothermal process– Isochoric process – Isobaric process– Adiabatic process– Work done during an Isothermal process - Work done during an Adiabatic process – Reversible and irreversible process – Carnot's cycle - Second law of thermodynamics – Concept of entropy - Change in entropy in a reversible process - Change in entropy in an irreversible process – The T-S diagram - Third law of thermodynamics.

Unit III: Thermodynamic Potentials and Transmission of heat

Maxwell's Thermodynamic relations – Application of Maxwell's Thermodynamic relations - Specific heat equation – Joule Thomson cooling - Joule Thomson coefficient – ClausiusClapeyron's Equation – The TdS equations – Coefficient of thermal conductivity – Lee's disc method for bad conductors – Convection – Black body – Stefan Boltzmann law - Derivation of Stefan's law and Newton's law of cooling from Stefan's law – Specific heat capacity by Newton's law of cooling.

Unit IV: Waves and Oscillations

Simple harmonic motion – Differential equation of motion executing S.H.M. – Solution of the differential equation of motion – Composition of two S.H.M. along the same direction and at right angles – Lissajous figure – Free, Forced and Resonant Vibrations – Vibrating Systems: Modes of vibration – stationary vibrations in strings – Sonometer: Laws of transverse vibration of strings – A.C frequency by sonometer – Melde's string.

Unit V: Acoustics and Ultrasonics

Introduction – Ultrasonic production – Magnetostriction method – Piezoelectric method – Detection of ultrasonic waves – Thermal method – Piezoelectric crystal method – Kundt's tube method – Application of ultrasonic waves: Depth of sea, sonar – Introduction to Acoustics – Classification of sound –Reverberation - Absorption coefficient – Sabine's formula – Factors affecting the architectural acoustics and their remedies.

Text Books:

1. Brijlal, Subrahmanyam, Hemne, P.S. (2014). *Heat, Thermodynamics and Statistical Physics.* (3rd ed.). New Delhi: S. Chand & Company Ltd.
   Unit I: 1.3, 1.4, 1.19 - 1.21, 2.9, 2.14.
   Unit II:4.1, 4.2, 4.6, 4.7, 4.10, 4.10.1, 4.10.2, 4.10.3, 4.12, 4.13, 4.20, 4.24, 4.28, 5.1, 5.4, 5.6, 5.7, 5.15.
   Unit III: 15.1, 15.11, 8.6, 8.12, 8.20, 8.21, 6.3, 6.4.1, 6.4.2, 6.4.3, 6.4.7, 6.5, 6.9.
2. Gupta, A.B. (2014). *Thermal Physics.* (3rd ed.). India: H.P. Roy Books and Allied (P) Ltd.
   Unit I: 3.2, 3.5, 3.7, 3.8, 3.11, 3.16
3. Govinda Rajan, S.R., Murugaiyan, Jayaraman, T. (1977). *Sound*. Rouchouse& Sons.
   Unit IV: Chapter II: 1, 3 – 6.
4. Ghosh, M., Bhattacharya, D. (2006). *A text book of Oscillations, Waves and Acoustics.* (3rd ed.) New Delhi: S.Chand &Company Ltd.
   Unit IV: 2.1, 2.4, 2.5, 2.8 – 2.10.
5. Brijlal, Subrahmanyam. *Waves and Oscillations*. New Delhi: S. Chand & Company Ltd.
   Unit IV: 3.1 – 3.3, 3.5 – 3.6.
6. Palanisamy, P.K. (2012). *Engineering Physics*. India: Schitech Publications Pvt. Ltd.
   Unit V: 9.1, 9.2, 9.2.1, 9.2.2, 9.3.1 - 9.3.3, 9.6.1.a, 9.6.1.b, 9.8, 9.9, 9.12 - 9.14, 9.16.

Reference Books:

1. Thomas, W., Sears, Gerhard, L. Salinger. (2004). Thermodynamics, Kinetic theory and Statistical Thermodynamics. Narosa Publishing House.
2. BrijLal, Subramaniam. (2008). Heat and thermodynamics. New Delhi: S. Chand & Company Ltd.
3. Subramaniam, N., BrijLal. (1995). A Text Book of Sound. (2nd ed.). India:Vikas Publishing
   House.

Semester II
Major Practical II - Physics Lab – II
Subject Code: PC17P2

No of hours per week	No of credits	Total no of hours	Marks
2	2	30	50

Objective: 1. To understand the basic concepts of thermal physics and sound.

2. To demonstrate and determine certain physical constants.

Any six experiments

1. Newton's law of cooling – Verification.
2. Specific Heat Capacity by Cooling.
3. Thermal Conductivity of a bad conductor – Lee's Disc.
4. Sonometer – Verification of the laws of transverse vibration.
5. Sonometer – Frequency of A.C. Mains.
6. Melde's String – Frequency of the Vibrator.
7. Lissajous Figure.
8. Compound Pendulum.
9. Thermal conductivity of air
10. Thermal conductivity of good conductor – Forbe's method.

Reference: Manual prepared by the department of Physics.

Semester II or IV

Allied Physics Paper –II
(Common for I B.Sc Maths and II B.Sc. Chemistry students)

Subject code: (AP1721/AP1741)

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objective: 1. To understand the basic principles of electricity, electromagnetism and electronics.

2. To make an awareness in physical concepts behind electricity and electronics.

Unit I: Thermal Physics

Conduction in solids: Thermal conductivity – Lee's disc method – Relation between thermal and electrical conductivities - Weidemann – Franz law – Convection : Newton's law of cooling – Determination of specific heat capacity of liquid – Radiation: Distribution of energy in the spectrum of black body – Results.

Unit II: Current Electricity

Ohms law- Electrical conductivity - Kirchoff's law - Wheatstone's bridge – condition for balance (no derivation) – Carey Foster's Bridge – Measurement of specific resistance – Determination of temperature coefficient of resistance – Potentiometer - calibration of voltmeter and ammeter.

Unit III: Electromagnetism

Electromagnetic Induction – Faraday's laws – Lenz's law – self-inductance – mutual inductance – Experimental determination of mutual inductance - Coefficient of coupling –Alternating current – Mean, RMS, peak - A.C. Circuits – LCR in series.

Unit IV Semi conductor Electronics

Semiconductors – pn junction diode – Half wave and full wave rectifier – Bridge rectifier- Zener diode - Regulated power supply- transistor – CE Configuration only.

Unit V: Digital Electronics

Number systems- decimal –binary – Conversion of Decimal Number into Binary Number (double dabble method) – binary addition, subtraction, multiplication and division – Logic gates – OR, AND, NOT, XOR, NAND and NOR gates –truth tables – NAND and NOR as Universal gates.

Text Books:

1. Ubald Raj.A., Jose Robin.G. (2012). *Allied Physics*. Marthandam: Indira Publications.
   Unit I: Chapter 3
   Unit II: Chapter 5
   Unit III: Chapter 2
2. Madhavan, Y, Thiagarajan., M, Annadurai., B, Balu.,T., Selvarajan. *Electromagnetism and Electronics*- Allied Physics Paper IV. Saravana offset.
   Unit III: Chapter 2:2.1,2.2,2.4,2.5,2.8,2.9,2.10
   Unit IV: Chapter 4: 4.1 – 4.7, 4.10
   Unit V: Chapter 5: 5.1 – 5.7,5.9 – 5.14

Reference Books:

1. Brijilal, Subramanyam, N. (1985). *Properties of Matter*. (4th Ed.), New Delhi: Eurasia Publishing House Pvt. Ltd.
2. Robert F. Kingsbury. (1966). *Elements of Physics,* (1st Ed.), London:Van Nostrand Company Inc.
3. Bhargava, N.N., Kulshreshtra, K.C., Gupta, S.C. (1984). *Basic Electronics and Linear Circuits*. (16th Ed.), New Delhi: Tata McGraw-Hill publishing Co.
4. Murugeshan. R. (2016). *Allied physics Paper I & II.* New Delhi: S. Chand & company Pvt Ltd.

Semester II

Non Major Elective Course
Everyday Physics- II (PNM172)

No of hours per week	No of credits	Total no of hours	Marks
4	3	60	100

Objective: 1. To provide basic knowledge on the concepts of electricity and electronics along with some applications.
2.To explain the wonders of world using the principles of physics.

Unit I: Basic electricity
Static electricity – Cells and batteries – Conductors and insulators – Resistors – Thermistors and light dependent resistors.
Unit II: Diodes and Capacitors
Structure of a diode – Light emitting diodes – Radio – Tape recorder – Record player.

Unit III: Transistors
Structure of transistor – Switching using transistors – High frequency oscillators.
Unit IV: Transistor amplifier
Transistor as an amplifier – Single stage amplifier – Two stage amplifier.
Unit V: Analog, Digital electronics and Integrated circuits
Continuous and non-continuous systems – Examples of analog systems – Logic gates – Structure of integrated circuits – The microprocessor.

Text Book:

1. Arnold, R.B. (1986). A first electronics course. England: Stanely Thorens (publishers) Ltd.
   Unit I: 1.1 – 1.10
   Unit II: 2.1 – 2.4, 6.1 – 6.4
   Unit III: 3.1. 3.2, 4.1 – 4.5
   Unit IV: 5.1 – 5.4
   Unit V: 7.1 – 7.5, 8.1 – 8.4

Reference Books:

1. Ryder, J.D. (2004). Electronics: Fundamentals and Applications. Prentice Hall International, INC., Englewood Cliffs.
2. Salivahanan, S., Kumar, N.S., (2012). Electronic Devices and Circuits. (3rd Ed.), New Delhi Tata McGraw-Hill Publishing Company Limited.

Semester III
Major Core III: Electricity and Magnetism

Subject Code: PC1731

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: **1.** To provide knowledge on the basic concept of electric and magnetic fields.
2. To understand the laws and theorems in electromagnetism and their application.

Unit I: Electric Field:
Coulomb's Law - Electric field - Electric field due to a point charge – Electric dipole –Force and Torque – Potential energy of a dipole in a uniform electric field – Lines of force – Flux of the electric field – Gauss law – Application: Electric field due to a uniformly charge sphere – Electric field due to a uniform Infinite cylindrical charge – Electric field due to an infinite plane sheet of a charge.

Unit II: Electrostatic Potential:
Conservative nature of electrostatic field – Potential difference – Electric potential as line integral of electric field – Potential at a point due to a point charge – Relation between electric field and electric potential - Potential at a point due to a uniformly charged conducting sphere – Electric potential energy – Electrical Images — Capacity of a conductor - Condensers – Capacitance of spherical capacitor - cylindrical capacitor – Parallel plate capacitor.

Unit III: Magnetic field and Electromagnetic induction:
Magnetic field – Definition of magnetic field $\vec{B}\rightarrow$ – Magnetic force on a particle – Magnetic field lines – Magnetic force on a current carrying wire – Torque on a current loop – Magnetic dipole moment - Faraday's law of electromagnetic induction- Lenz law- Explanation of Faradays law- Self inductance- Mutual inductance- Coupling of two coils with flux linkage-Magnetic energy stored in the inductance.

Unit IV: Electrical Circuits and Network theorems :
Introduction – Kirchoff's laws – Series circuit – AC through an L-R circuit – AC through an C-R circuit – LCR in series resonance circuit – Vector diagram method – The series circuit at resonance - Parallel resonance circuit.
Network theorems: Introduction – Ideal constants – Voltage and constant current source – Superposition theorem – Reciprocity theorem – Thevenins theorem – Norton's theorem – Maximum power transfer theorem.

Unit V: Electrical Measurements:
AC bridges: Introduction – AC bridges for measuring capacitance – The Desauty bridge – AC bridges for measuring inductance –Anderson's L-C bridge – Owen's L-C bridge – Moving coil galvanometer – Correction for damping in Ballistic galvanometers – Measurement of charge sensitivity of a ballistic galvanometer – Determination of the absolute capacity of a condenser

Text Books :

1. Murugesan, R. (2011). *Electricity and Magnetism*. (9^{th} ed.). Ram Nagar, New Delhi: S.Chand& Company Ltd.
Unit I : 1.2, 1.4 -1.7, 1.11, 2.1 – 2.2, 2.5 – 2.6, 2.8 – 2.9
Unit II : 3.1 – 3.5, 3.8 – 3. 10, 4.1, 4.5

Unit V : 18.1 – 18.6

2. Brijilal, Subrahmanyam, N. (1982.) *Electricity and Magnetism*. (9th Ed.). Delhi: Ratan Prakashan Mandir, Educational and University publishers.
   Unit V: 12.4 - 12.5, 12.7, 12.9, 13.36, 13.39
3. Sehgal, Chopra, Sehgal. (1991). *Electricity and Magnetism*. (4th ed.).
   Unit IV : 10.1 – 10.2, 11.12 – 11.13- 11.16, 11.19- 11.21, 11.26
   Unit V: 12.1 – 12.2, 12.7 – 12.8
4. Halliday, Resnick, Walker. (2006). *Fundamentals of Physics*. (6th Ed.). Wiley.,India Pvt Ltd-
   Unit I : 29.1, 29.2, 29.7 – 29.9
5. SatyaPrakash. (1995). *Electromagnetic Theory & Electrodynamics*. (8th ed.).
   KedarNath, RamNath& Co.-Meerat
   Unit III : Chapter 6: 6.1-6.2,6.8-6.11

Reference Books:

1. David J. Griffiths. (2004). *Introduction to Electrodynamics*. (3rd ed.). New Jersy: Prentice Hall of India Private Ltd.
2. Vasudeva, D.N. (1983). *Fundamentals of Magnetism and Electricity*. Ram Nagar, New Delhi: S.Chand & Company Ltd.
3. Tayal D.C. (1993). *Electricity and Magnetism*. USA:Himalaya Publishing House.

Semester III

Elective I (a): Non – Conventional Energy Sources (Elective – I)

Subject Code: PC1732

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To provide knowledge on various alternative sources of energy.

2. To create awareness about the non-conventional energy sources which will solve the energy crisis.

Unit I: Solar Energy

Introduction- Solar water heating - Solar electric power generation- Solar photo voltaics – Agriculture and industrial process heat – Solar distillation – Solar cooker - Solar green houses - Solar production of hydrogen

Unit II: Wind Energy

Basic principles of wind energy conversion - Nature of the wind- Power in the wind- Site selection considerations - Basic components of WECS - Classification of WEC systems - Advantages and disadvantages of WECS - Wind energy collectors - Horizontal axial machines

Unit III: Bio Energy

Bio mass- Bio conversion technologies- Wet processes- Dry processes- Photosynthesis- Bio gas generation-Factors affecting biodigestion or generation of gas – Classification of Bio gas plants - Constructional details of digesters

Unit IV: Geo Thermal Energy and Chemical energy

Nature of geo thermal fields – Geo thermal sources - Hydrothermal resources - Vapour dominated systems - Liquid dominated systems – Geo pressured resources - Magma resources - Fuel cells - Design and principle of operation of a fuel cell – Types of fuel cell – Advantages and disadvantages of fuel cells – Conversion efficiency of fuel cells – Types of electrodes – Work output and emf of fuel cells – Applications of fuel cells

Unit V: Energy from the ocean and Hydrogen energy

Introduction- Ocean thermal electric conversion(OTEC) - Methods of ocean thermal electric power generation- Open cycle OTEC system- Closed or Anderson OTEC cycle- Heat exchangers- Bio fouling- Site selection- Energy utilization- Hybrid cycle- Prospects of ocean thermal energy conversion in India- Hydrogen energy- Hydrogen production- Electrolytic production of hydrogen- Thermo chemical methods.

Text Book:

Rai, G.D. (2008). *Non-conventional energy sources,* (4th ed.). New Delhi: India: Khanna Publishers.

Unit I : 5.1-5.2, 5.6-5.8, 5.11-5.13

Unit II :6.2:6.2.1-6.2.2 (excluding maximum power), 6.4-6.8 (excluding 6.8.3-6.8.4)

Unit III :7.1-7.5,7.6, 7.10

Unit IV :8.3-8.5 (excluding low temperature liquid dominated system), 8.6, 8.8, 10.1

Unit V : 9.1-9.2.11, 11.1-11.2

Reference Books:

1. Sukhatme, S.P. (1997). *Solar energy*. (2nd ed.) India: Tata McGraw Hill Education.
2. Rai, G.D. (1995). *Solar Energy Utilization*. (5th ed.). New Delhi: Khanna Publishers.

Semester III

Elective I (b): Medical Physics (Elective – I)

Subject Code: PC1733

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To impart knowledge on the physical principles involved in the living body.
2. To develop the skills in Medical diagnostic and imaging systems.

Unit I: PHYSICS OF THE BODY-I

Basic Anatomical Terminology: Standard Anatomical Position - Planes. Familiarity with terms like – Superior – Inferior – Anterior – Posterior – Medial – Lateral - Proximal and Distal. Mechanics of the body: Skeleton – forces and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements - Stability and Equilibrium. Energy household of the body: Energy balance in the body – Energy consumption of the body - Heat losses of the body - Thermal Regulation. Pressure system of body: Physics of breathing, Physics of cardiovascular system.

Unit II: PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound - Production of speech - Physics of the ear - Diagnostics with sound and ultrasound. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system - Electrical signals and information transfer.

Unit III: PHYSICS OF DIAGNOSTIC SYSTEMS

X-RAYS: Electromagnetic spectrum - production of x-rays - x-ray spectra – Brehmsstrahlung - Characteristic x-ray. X-ray tubes & types: Coolidge tube - x-ray tube - Design - Tube cooling stationary mode - Rotating anode x-ray tube - Tube rating – Quality and intensity of x-ray. X-ray generator circuits - Half wave and full wave rectification - Filament circuit - Kilo voltage circuit - Types of X-Ray Generator - High frequency generator - Exposure timers and switches - HT cables - HT generation.

Unit IV: MEDICAL IMAGING PHYSICS:

Evolution of Medical Imaging - X-ray diagnostics and imaging - Physics of nuclear magnetic resonance (NMR) - NMR imaging - MRI Radiological imaging - Ultrasound imaging - Physics of Doppler with applications and modes - Vascular Doppler. Radiography: Filters – Grids – Cassette - X-ray film - Film processing - Fluoroscopy. Computed tomography scanner-principle & function – Display – Generations - Mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display).

Unit V: RADIATION , PROTECTION AND THERAPEUTIC SYSTEMS

Principles of radiation protection - Protective materials-radiation effects – somatic - Genetic stochastic and deterministic - Effect. Personal monitoring devices: TLD film badge - pocket dosimeter - OSL dosimeter. Radiation dosimeter. Natural radioactivity - Biological effects of radiation – Radiation monitors**.** Steps to reduce radiation to Patient - Staff and Public. Dose Limits for Occupational workers and Public. AERB: Existence and Purpose. Diagnostic nuclear medicine: Radio pharmaceuticals for radioisotope imaging - Radioisotope imaging equipment - Single photon and positron emission tomography. Therapeutic nuclear medicine:

Interaction between radiation and matter Dose and isodose in radiation treatment. Medical Instrumentation: Basic Ideas of Endoscope and Cautery - Sleep Apnea and C pap Machines - Ventilator and its modes.

Text Books:

1. Thayalan, K. (2009). *Basic Radiological Physics* (2nd ed) New Delhi: Jaypee Brothers Medical Publishing Pvt. Ltd.
2. Irving P. Herman. (2007). *Physics of the human body*. (1st ed) Atlanta, NewYork: Springer.
3. Bushberg.J.T, Seibert J.A, Leidholdt E.M, Boone J.M (2002) *The essential physics of Medical Imaging*.(2nd ed.) Philadelphia, USA: Lippincott Williams &Wilkins..

Reference Books:

1. Cameron, J.R, Skofronick J.G. (1978). *Medical Physics (*1st ed*)*. New York: Wiley.
2. Curry T.S, Dowdey J.E, Murry R.C, (1990). *Christensen's Physics of Diagnostic Radiology, (4 thed).* Philadelphia, USA: Lippincot Williams & Wilkins.
3. Khan, F.M., (2003). *Physics of Radiation Therapy* (3rd ed.). USA: Lippincot Williams & Wilkins.
4. Livingstone. R.S, (2007) *Handbook of Physics in Diagnostic Imaging.* (1st ed). Chennai: B.I. Publication Pvt Ltd.
5. Johns, H.E, Cunningham J.R, (1983) *The Physics of Radiology.(4th ed)* Springfield,U.S : Charles C Thomas Pub Ltd.

Semester III
Elective I (c): Physics of Earth (Elective – I)

Subject Code: PC1734

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To provide the knowledge regarding the origin of the Universe and its dynamical processes.
2. To understand the various important topics in geophysics.

Unit I: The Earth and the Universe:

Origin of universe - Creation of elements and earth - Introduction to various branches of Earth Sciences - General characteristics and origin of the Universe - The Milky Way galaxy - Solar system - Earth's orbit and spin - The Moon's orbit and spin - The terrestrial and Jovian planets - Meteorites & Asteroids - Earth in the Solar system – Origin - size – shape – mass – density - Rotational and revolution parameters and its age.

Unit II: Structure:

The Solid Earth: Mass – Dimensions - Shape and topography - Internal structure - Magnetic field - Geothermal energy. The Hydrosphere: The oceans, their extent, depth, volume, chemical composition. River systems - The Atmosphere: variation of temperature - Density and composition with altitude - clouds. The Cryosphere: Polar caps and ice sheets. Mountain glaciers. The Biosphere: Plants and animals. Chemical composition - mass. Marine and land organisms.

Unit III: Dynamical Processes:

The Solid Earth: Origin of the magnetic field - Source of geothermal energy - Convection in Earth's core and production of its magnetic field – Mechanical layering of the Earth - Introduction to geophysical methods of earth investigations - Concept of plate tectonics - Sea-floor spreading and continental drift - Geodynamic elements of Earth - Mid Oceanic Ridges – Trenches - Transform faults and island arcs - Origin of oceans - Continents - Mountains and rift valleys - Earthquake and earthquake belts - Volcanoes: types products and distribution - The Hydrosphere: Ocean circulations - Oceanic current system and effect of coriolis forces - Concepts of eustasy - Tend – air-sea interaction - Wave erosion and beach processes – Tides – Tsunamis - The Atmosphere: Atmospheric circulation - Weather and climatic changes - Earth's heat budget - Cyclones.

Unit IV: Climate:

Earth's temperature and greenhouse effect - Paleoclimate and recent climate changes - The Indian monsoon system - Biosphere: Water cycle - Carbon cycle - Nitrogen cycle - Phosphorous cycle - The role of cycles in maintaining a steady state.

Unit V: Evolution:

Time line of major geological and biological events - Origin of life on Earth - Role of the biosphere in shaping the environment - Future of evolution of the Earth and solar system: Death of the Earth - Disturbing the Earth – Contemporary dilemmas - Human population growth - Atmosphere: Green house gas emissions - Climate change - Air pollution - Hydrosphere: Fresh water depletion - Geosphere: Chemical effluents - Nuclear waste - Biosphere: Biodiversity loss – Deforestation - Robustness and fragility of ecosystems.

Text Books:

1. Jay Melosh, H. (2011). *Planetary Surface Processes*. (1st ed.). Cambridge: Cambridge University Press.
2. Emiliani C. (1992). "*Planet Earth"- Cosmology, Geology and the Evolution of Life and Environment.* (1st ed) (reprint 2007) NewYork : Cambridge University Press.

Reference Books:

1. John Harte. (1988), *Consider a Spherical Cow: A course in environmental problem solving.* New Jersey, University Science Books.
2. Peter McLaren DonaldDuff, Arthur Holmes, (1993) *Holme's Principles of Physical Geology.* (4 thed) NewYork: Chapman & Hall.

Semester III

Physics Lab – III

Subject Code: PC17P3

No of hours per week	No of credits	Total no of hours	Marks
2	2	60	100

Objectives: 1. To understand the concepts of electricity and magnetism through experiments.

2. To demonstrate the working of deflection magnetometer, BG, Desauty's and Owen's bridge.

Any seven experiments

1. Determination of figure of merit using B.G.
2. Determination of absolute capacity of condenser using B.G
3. Determination of mutual inductance of two coils using B.G
4. Desauty's bridge – comparison of capacitance.
5. Owen's bridge – determination of self inductance of coil.
6. Verification of Thevinins and Nortons theorem.
7. LCR- Series and parallel resonance circuit.
8. Anderson's Bridge
9. Thermistor Characteristics

Semester IV
Major Core –IV: Analog Systems and Applications
Subject Code: PC1741

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives:

1. To study and analyze the basic concepts and action of semiconductor diodes transistors and operational amplifiers.
2. To analyze the working of electronic circuits and applications.

Unit I: Semiconductor diodes and transistors

Semiconductor materials – Intrinsic semiconductors – Extrinsic semiconductors – N-type semiconductor – P-type semiconductor – P-N Junction – P-N Junction with no external voltage – P-N junction with forward bias – P-N junction with reverse bias – V-I characteristics of a P-N junction diode – Static and dynamic resistance of a diode – Half wave rectifier – Bridge Rectifier – Calculation of ripple factor and rectification efficiency – Filters (π filter) – Zener diode – Voltage regulator – Junction transistor structure – Working of transistor – Amplifying action – Three configurations – Transistor characteristics (CE configuration only).

Unit II: Transistor amplifier

Transistor biasing – Selection of operating point – Bias stabilization – Fixed bias and Voltage divider bias – Single stage transistor amplifier – Equivalent circuit method – Development of transistor AC equivalent circuit – h-parameter equivalent circuit – Analysis of a single state CE amplifier using hybrid models: Input and output impedance, current-voltage and power gain.

Unit III : Feedback in amplifiers

Concept of feedback in amplifiers – Types of feedback – Voltage gain of amplifier – Effect of negative feedback on gain stability, distortion and noise, input impedance, output impedance and bandwidth – Amplifier circuits with negative feedback – RC coupled amplifier without bypass capacitor – Emitter follower.

Unit IV : Oscillator

Need for an oscillator – Generating sine wave using tuned oscillator circuit – Frequency of oscillations in LC circuit – Sustained oscillations – Positive feedback amplifier as an oscillator (Barkhausen criterion) – Starting voltage – LC oscillators – Hartley and Colpitt's oscillators – Basic principle of RC oscillator – RC phase shift oscillator.

Unit V: Operational amplifier

Parameters of a general amplifier – Ideal operational amplifier – Inverting amplifier – Non-inverting amplifier – Difference amplifier – Operational amplifier circuits – Voltage follower – Summing amplifier – Integrator – Differentiator – Log and antilog amplifiers – Comparators and Schmitt trigger.

Text Books:

1. Bhargava, N.N.. Kulshreshtha, D.C., Gupta, S.C. (2002). *Basic Electronics and Linear circuits.* (35th reprint) New Delhi: Tata McGraw-Hill Publishing Company Limited.

   Unit 1: Chapter 3 : 3.2, 3.5, 3.6, 3.6.1-3.6.2
   Chapter 4 : 4.1, 4.2.1 - 4.2.3, 4.3, 4.5, 4.6.1 - 4.6.2, 4.7, 4.8.4, 4.9.3
   Chapter 5 : 5.2, 5.4- 5.6, 5.7.2

Unit II: Chapter 7: 7.2 - 7.4, 7.6.1, 7.6.4
Chapter 8 :8.2, 8.4, 8.4.1- 8.4.3
Unit III: Chapter 12: 12.1-12.5
Unit IV: Chapter13:13.1, 13.3, 13.3.1, 13.3.2, 13.4, 13.4.1, 13.5, 13.5.3, 13.5.4, 13.6, 13.6.1-13.6.2.

2. Rajiv Kapadia. (2012). *Operational Amplifiers and Linear Integrated Circuits*. Jaico Publishing House.

Unit V: Chapter 1:1.2 - 1.7
Chapter 2: 2.2.1- 2.2.3, 2.3.2

Reference Books:

3. Millman, J. Halkias, C.C. (1991). *Integrated Electronics*. New Delhi: Tata McGraw-Hill Publishing Company Limited.
4. Ryder, J.D. (2004). *Electronics: Fundamentals and Applications*. Prentice Hall International, INC., Englewood Cliffs.
5. Salivahanan, S., Kumar, N.S. (2012). *Electronic Devices and Circuits*. (3rd ed.). New Delhi: Tata McGraw-Hill Publishing Company Limited.

Semester IV

Elective – II (a) : Fibre Optics

Subject Code: PC1742

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives: 1. To Impart the basic knowledge of optic fibres and its application in communication.

2. To Enable the students to identify the running efficiency of public's internet, TV and phone cables running efficiently and safety.

Unit I: Optical Fibers

What are optical 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 cone of a fibre – Numerical aperture (General), numerical aperture of a G.I.fibre – modes of propagation – meridional and skew rays – Number of modes and cut – off parameters of fibres – single mode propagation – comparison of step and graded index fibres – application of fibres – fibre classification – stepped index fibre, stepped index mono mode fibre – disadvantage. Graded Index multimode fibre, plastic fibres.

Unit II: Light Sources and Detectors:

Introduction - LED – The processes involved in LED – structure of LED – LED materials – output power characteristics of LED – LASER – Laser operation – semiconductor laser diode – spatial emission pattern of laser - current versus output characteristics of a laser. Photo Detectors – Characteristics of Photo – detectors – Photoemissive Photo – detectors, PIN photodiode, Avalanche photo – diode, Photo – transistor, Bit-Error rate.

Unit III :Fibre fabrication, fibre losses and dispersion:

Fibre fabrication – external CVD-AVD-ICVD- characteristics of these methods – fibre drawing and coating – double crucible method. 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 - and cladding losses – Dispersion in optical fibres – intermodal dispersion – mixing of modes – material chromatic dispersion – wave guide dispersion – dispersion power penalty – total dispersion delay – maximum transmission rate.

Unit IV: Optical couplers, splicing and measurement on optic fibres:

Types of optical couplers (Biconically tapered directional coupler, beam splitting directional couplers, T couplers). Calculators on couplers – splicing – mechanical splicing – steps involved in splicing procedure – losses in splices and connectors – loss comparison – measurement of numerical aperture and its related terms – OTDR – working – measurement of fibre loss by OTDR – limitations and advantages.

Unit V: Modulation and detection

Introduction – LED analog modulation – digital modulation – laser modulator (analog and digital) – formats of modulation – PCM – merits and demerits of PCM - intensity modulation – External optical modulators - electro optic modulator – acousto optic modulator – demodulation methods – direct detection methods – heterodyne detection receiver – Homodyne detection receiver – modulation parameter converters.

Text Book:

SubirkumarSarkar. (2008). *Optical fibres and fibre optic communication systems*. New Delhi: S. Chand & Company Ltd.

Unit I : Pages 1 – 27, 35-37 (Solved examples included)

Unit II : Pages 112 – 117, 120 – 126, 134 – 135, 138 – 142 (solved Examples included)

Unit III : Pages 39 – 44, 47 – 51, 81 – 94, 96 – 110 (solved examples included)

Unit IV : Pages 161 – 163, 166 – 169, 178 – 182, 184 – 195, 350 – 360, 370 (solved examples included)

Unit V : Pages 254 – 264
Optoelectronics – A. Ubaldraj and G. Jose Robin, Indira Publication (2002).
Pages 151 - 165

Reference Book:

1. Wilson, Hawkes. (2005). *An introduction Optoelectronics*. New Delhi: Prentice Hall of India.
2. Battacharya, P. (2002). *Semiconductor Optoelectronics*. New Delhi: PHI.

Semester IV
Elective II (b) : Microprocessor

Subject Code: PC1743

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To introduce the basic concepts of microprocessor and to develop the assembly language programming skills

2. To develop the microprocessor based programs for various applications

Unit I: Microprocessor Architecture

The 8085 microprocessor unit – Address Bus-Data Bus- Control and status signals, power supply and clock frequency-externally initiated signals-Microprocessor Communication and Bus Timings (excluding timing diagram) – demultiplexing the Bus AD_7 – AD_0- Generating control signals – Detailed look at the 8085 microprocessor unit and its Architecture- Decoding and Executing an instruction-Example of an 8085-Based Microcomputer-Machine cycles and Bus Timings-Opcode Fetch Machine cycle-Memory Read Machine cycle- How to recognize Machine Cycles

Unit II: Introduction to 8085 Assembly language programming

Instruction classification – Instruction format-Instruction Word Size- Opcode Format-Data Format-Instruction and Data storage – How to write, assemble and execute a simple program – Overview of the 8085 instruction set-Writing and Hand Assembling a Program.

Unit III: Introduction to 8085 instructions

Data transfer operations – Arithmetic operations – Logic operations – Branch operations – Writing assembly language programs – debugging a program

Unit IV: Programming Techniques with Additional Instructions

Programming Techniques-Looping, Counting and indexing -Arithmetic operations related to memory – Logic operations: Rotate – Logic operations: Compare

Unit V: Counters and time delay

Counters and time delay – Illustrative program: hexa decimal counters – Illustrative programs : zero to nine (modulo ten) counter –Illustrative program – Generating pulse wave forms-Debugging Counter and Time Delay Programs

Text Books:

Ramesh. S. Goankar, (2013). *Microprocessor architecture, Programming and applications with the 8085*, (6 th ed.). India: Penram International Publishing Pvt Ltd.

Unit I - Chapter 4---4.1, 4.2

Unit II - Chapter 2---2.2 to 2.6

Unit III - Chapter 6---6.1 to 6.6

Unit IV - Chapter 7---7.1, 7.3 to 7.5

Unit V - Chapter 8--- 8.1 to 8.5

Reference Books:

2. NagoorKani, (2004) *Microprocessor and its Applications*, (1st ed.). Chennai: RBA Publications
3. Ram.B and Sanjay Kumar, (2013). *Fundamentals of Microprocessors and Microcontroller* (7th ed.). New Delhi: DhanpatRai Publications (P) Ltd

Semester IV
Elective II (c) : Communication System

Subject Code: PC1744

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives:

1. To impart knowledge on the basis of communication techniques and its applications.
2. To and development of technology for communications like telephones, mobile and satellite systems.

Unit I: Amplitude Modulator:

Introduction to communication – means and modes - Need for modulation - Block diagram of an electronic communication system - Brief idea of frequency allocation for radio communication system in India (TRAI) – Electromagnetic communication spectrum - Band designations and usage - Channels and base-band signals.

Unit II: Frequency and Pulse Modulation:

Frequency Modulation (FM) and Phase Modulation (PM) - Modulation index and frequency spectrum – Equivalence between FM and PM - Generation of FM using VCO - FM detector (slope detector) - Qualitative idea of Super heterodyne receiver - **Pulse Modulation**: Channel capacity - Sampling theorem - Basic Principles- PAM, PWM, PPM, modulation and detection technique for PAM only - Multiplexing.

Unit III: Digital Pulse Modulation:

Need for digital transmission - Pulse Code Modulation - Digital Carrier Modulation Techniques - Sampling, Quantization and Encoding – Concept of Amplitude Shift Keying (ASK) - Frequency Shift Keying (FSK) - Phase Shift Keying (PSK) - and Binary Phase Shift Keying (BPSK).

Unit IV: Satellite Communication:

Introduction - Need - Geosynchronous satellite orbits - geostationary satellite advantages of geostationary satellites - Satellite visibility - transponders (C - Band) - Path loss, ground station, simplified block diagram of earth station - Uplink and downlink.

Unit V: Mobile Telephony System:

Basic concept of mobile communication - Frequency bands used in mobile communication - Concept of cell sectoring and cell splitting - SIM number - IMEI number - Need for data encryption - Architecture (block diagram) of mobile communication network - Iidea of GSM, CDMA, TDMA and FDMA technologies - simplified block diagram of mobile phone handset - 2G, 3G and 4G concepts (qualitative only).

Text Books:

1. Roddy, D. & Coolen, J. (2008). *Electronic Communications*. (4th ed.). India: Pearson Education.
2. Kennedy, G. (1999). *Electronic Communication systems*. (3rd ed.). Newdelhi: Tata McGraw Hill.
3. Andrea Goldsmith. (2015). *Wireless communications*. India: Cambridge University Press.

Reference Books:

1. Tomasi, (2015). *Advanced Electronics Communication Systems*. (6th ed.). United States: Prentice Hall.
2. Frenzel, (2012). *Principles of Electronic communication systems* . (3rd ed.). Newdelhi: Tata McGraw Hill.
3. Haykin, S. (2006). *Communication Systems.* (4th ed.). India: Wiley.
4. Roy Blake, (2002). *Electronic Communication system.* (5th Ed.). United States: Cengage Learning

Semester III
Physics Lab – IV

Subject Code: PC17P4

No of hours per week	No of credits	Total no of hours	Marks
2	2	30	100

Objectives: 1. To enable the students to understand the principle and working of analog electronic circuits through some basic experiments.

2. To demonstrate the working of Zener diode, oscillators and op-amp.

Any seven experiments:

1. V-I Characteristics of a Zener diode
2. Zener diode – Voltage regulator
3. Bridge rectifier – with and without filter
4. Single stage CE amplifier – with feedback
5. Single stage CE amplifier – without feedback
6. Logarithmic Amplifier
7. Addition of two DC voltages using Op-amp in inverting and non-inverting modes
8. Adder and subtractor using Op-amp
9. Differentiator and integrator using Op-amp

Semester V

Major Core –V: Elements of Modern Physics

Subject Code: PC1751

No of hours per week	No. of credits	Total No. of hours	Marks
6	5	75	100

Objectives: 1. To provide insight into wave- particle duality and its consequence.

2.To apply skill related to principle and concepts of modern physics.

Unit I: Particle Nature of Radiation

Introduction – Spectral distribution of black body radiation – Quantum hypothesis of Planck – Planck's law of radiation – Photoelectric Effect – Photoemission characteristics – Failure of electromagnetic wave theory – Einstein's Photoelectric equation – Millikan's verification of Einstein's equation – Continuous X-ray Spectrum – Compton effect – Energy of scattered radiation and recoil electron – Compton scattering Vs Photoelectric effect – Pair Production – Particle or Waves.

Unit II: Wave Nature of Particles

Introduction – de Broglie waves and wavelength – Wavelength Vs Voltage – Davisson – Germer experiment – Experiments of G.P Thomson – Frisch and Stern's method – Standing electron waves in a circular orbit – Heisenberg's Uncertainty principle – Uncertainty relation – Uncertainty principle and concept of Bohr orbits – Derivation of the Uncertainty principle – phase velocity and group velocity – Phase and group velocities of matter waves.

Unit III: Atomic spectra

Introduction – Spectra of H atom – Orbital magnetic moment of H atom – Larmor precession – Stern & Gerlach experiment – Electron Spin – Vector atom model – Spin-orbit interaction – Pauli's exclusion principle – Total angular momentum in multi-electron atoms – Energy levels and transitions of helium – Alkali spectra – Normal Zeeman effect – Anomalous Zeeman effect – Stark effect.

Unit IV: Atomic models and Quantum Mechanics

Introduction – Atomic spectra – Thomson's model – Rutherford's nuclear atom model – Bohr's model of hydrogen atom – Hydrogen spectrum – Ritz combination principle – Correction for finite nuclear mass – Discovery of heavy hydrogen – Hydrogenic atoms – Sommerfeld's model – Bohr's correspondence principle – Resonance, excitation and ionization potentials – Measurements of critical potentials – Merits and demerits of Bohr's theory

Schrodinger's wave equation – Schrodinger time dependent wave equation – Schrodinger time independent wave equation – Physical significance of the wave function – Applications of Schrodinger wave equation – Particle in a one dimensional potential well – Particle in three dimensional box – Degeneracy – Electrons in a metal.

Unit V: Special Theory of Relativity

Introduction – Frame of reference – Galilean transformations – Michelson-Morley experiment – Einstein's postulates – Lorentz transformations – Length contraction – Time dilation – Relativity of simultaneity – Addition of relativistic velocities – Relativistic mass – Mass-energy relation – Minkowski's four dimensional space – Time continuum – General theory

of relativity – Massless particle.

Text Books:

1. Palanisamy, P.K. (2012). *Engineering Physics*. (1st ed.)., India: Scitech Publications (India) Pvt.Ltd.
   Unit IV: Chapter 8: 8.6, 8.7

   Unit V: Chapter 7: 7.1-7.16

2. Gupta, A.B. (2015). *Modern Physics*. (2nd ed.). Kolkatta: Books and Allied (p) Ltd.
   Unit I: Chapter 2: 2.1-2.15

   Unit II: Chapter 3: 3.1-3.13

   Unit III: Chapter 7, 7.1 – 7.16

   Unit IV: Chapter 4, 4.1 – 4.15

Reference Books

1. Aruldhas, G., Rajagopal, R. (2005).*Modern Physics*. (1st ed.). India: Prentice Hall of India Pvt Limited.
2. Arthur Beiser. (2006). *Concepts of Modern Physics*. (6th ed.). India: Tata McGraw-Hill Edition.

Semester V
Major Core VI: Optics
Subject Code: PC1752

No. of hours per week	No of credits	Total no hours	Marks
6	5	90	100

Objective:

1. To study the electromagnetic nature of light.
2. To enable the students to link the theory with day to day life.

Unit I:Geometrical Optics

Introduction – Refractive index and optical path – Sign convention – Refraction through lenses – Principle focii – Deviation produced by a thin lens – Power of a lens - Aberrations – Spherical aberration in a lens –Methods of reducing spherical aberration (brief) – Chromatic aberration - Refraction through a prism – Angular and chromatic dispersion – Dispersive power- Achromatism in prism – Deviation without dispersion – Dispersion without deviation - Direct vision spectroscope – Condition for achromatism of two lenses placed in contact and separated by a finite distance.

UnitII:Wave Optics:

Oscillations – Waves – Travelling waves – Wave front and ray – Examples of waves – Characteristics – Mathematical representation – Phase velocity – Complex representation – Wave packet and band width – Group velocity – Propagation of light waves: Introduction – Maxwell's equations – Physical significance – Electromagnetic waves – Constitutive relations – Wave equation for free space – Velocity of Electromagnetic waves – Relation between refractive index and relative permitivity – Uniform plane waves – Transverse nature of plane waves – Relation between E and H in a uniform plane wave – Characteristic impedance.

Unit III:Interference:

Introduction – Young's experiment – Coherent source – Phase and path difference – Analytical treatment – Theory of inference – Fresnel's biprism – Fringes with white light – Lioyd's mirror – Interference in thin films – Interference due to reflected and transmitted light – Wedge shaped thin film – Testing the planeness – Newton's rings – Determination of λ.

Unit IV:Diffraction:

Fraunhofer diffraction : Introduction – Single slit – Intensity distribution – Double slit – Comparison between interference and diffraction – Fraunhofer diffraction at N slits – Plane diffraction grating – Theory – Principal maxima – Oblique incidence – determination of λ using grating – Dispersive power – Fresnel's diffraction : Introduction – Huygen's Fresnel theory – Fresnel's assumptions – Rectilinear propagation of light – Zone plate – Action of zone plate – Difference between convex lens and zone plate – Diffraction pattern due to straight edge – Narrow slit – Narrow wire.

Unit V:Polarization :

Transverse nature of light waves – Unpolarized and polarized light – Types of polarization – Production and analysis of plane polarized light – Polarizer and analyser – Anisotropic crystals – Double refraction – Ordinary and extra ordinary ray – Positive and negative crystals – Nicol prism – Quarter and half wave plates – Production and analysis of elliptically and circularly polarized light – Analysis of polarized light.

Text Books:

1. Subrahmanyam Brijilal, N. (2004). *A text book of optics*. (1st ed.). Newdelhi: S. Chand and Company Pvt.Ltd.

   Unit I: Sections: 1.1, 1.2, 1.5, 1.6, 2.1 – 2.3, 2.5, 2.7, 3.1, 3.5, 3.6, 3.12 – 3.14, 3.16, 3.18, 3.22 – 3.24, 3.27, 3.28

   Unit III: Sections: 8.1 – 8.6, 8.8, 8.9, 8.11, 8.15 – 8.17, 8.21 - 8.24

2. Subrahmanyam Brijilal, N., Avadhanulu, M.N. (2015). *A text book of Optics*. (25th ed.). Newdelhi: S. Chand and Company Pvt.Ltd.

   Unit II: Sections: 12.1 – 12.6, 12.8, 12.9, 12.11, 12.14
   Unit II: Sections: 13.1 – 13.5
   Unit IV: Sections: 17.1 – 17.7, 17.10, 17.11, 17.12
   Sections: 18.1, 18.2, 18.2.1, 18.4 – 18.7.3, 18.7.6, 18.7.7
   Unit V: Sections: 20.1 – 20.6.1, 20.8, 20.10, 20.11, 20.11.2, 20.11.3, 20.12, 20.19.1, 20.19.2, 20.20 – 20.22

Reference Books:

1. Murugeshan, R., Kiruthiga Sivaprasath. (2014). *Optics and spectroscopy*. (9th ed.). Newdelhi: S. Chand and Company Pvt. Ltd.
2. Gupta, A.B. (2010). *Modern Optics*. (2nd ed.). Kolkata: ArunabhaSen Books and Allied (P) Ltd.

Semester V
Major Core VII: Solid State Physics
Subject Code: PC1753

No of hours per week	No of credits	Total no of hours	Marks
5	5	90	100

Objectives:

1. To impart knowledge on the structure of crystals and the different types of materials.
2. To develop a scientific attitude at micro and nano scales of materials

Unit I: Bonding in Solids

Introduction – Bonding in solids – An over view of an atom – Condition for bonding – Octet rule and stability – Van der Waal's bonding – Ionic bonding – Covalent bonding – Dipole-dipole interactions – Hydrogen bonding – Metallic bonding – Mixed bonding – Calculation of ionization energies for compounds – Comparison of physical properties

Unit II: Crystalline Materials

Classification of solids – Periodicity in crystalline solids – Lattice translation vectors – Unit and primitive cells – Bravais lattices – Symmetry operations- Crystal indexing – Miller indices of lattice planes – Directions in crystals – Atomic packing factor (APF) – Density and lattice constant - Other common crystal structures

Unit III: Magnetic Materials

Magnetic and nonmagnetic materials – Magnetic dipole compared with electric dipole – Important terms in magnetism – Sources of permanent magnetic moment- Classification of magnetic materials – Theory of diamagnetism – Classical theory of para magnetism – Theories of ferromagnetism – The Weiss exchange (molecular) field – Domain theory – Hysteresis – Hard and soft magnetic material- Antiferromagnetism - Ferrimagnetism

Unit IV: Dielectric Materials

Dielectrics – Polarizability and dielectric constant – Types of polarization – Langevin's theory of polarization in polar dielectrics – Piezoelectric materials – Ferroelectrics – Antiferroelectricity – Internal or local field – Clausius Mossotti equation- Lorentz- formula - Frequency and temperature effects on polarization - Dielectric breakdown - Dielectric loss – Classification of insulating materials – Important insulating materials

Unit V: Semiconductors and Superconductors

Bands in solids – Elemental and compound semiconductors – Conduction in semiconductors – Band structure of semiconductors – Concentration of charge carriers – Mobility and conductivity in semiconductors – Discovery of superconductivity – Superconductivity and magnetism – Critical magnetic field – Meissner effect – Magnetic induction in superconductors – Type I and Type II Superconductors – Isotope effect - Applications of superconductors.

Text Book :

Rita John. (2014). Solid State Physics. (1st ed.). New Delhi: McGraw Hill Education (India) Pvt. Ltd.

Unit I: Chapter1: 1.1-1.12

Unit II: Chapter 2: 2.1 – 2.7, 2.9 – 2.12, 2.15

Unit III: Chapter 8: 8.1 –8. 6, 8.7: 8.7.1, 8.10: 8.10.1, 8.10.4, 8.10.6, 8.10.7, 8.11-8.12

Unit IV: Chapter 10: 10.1 – 10.5, 10.6: 10.6.1 – 10.6.2, 10.7 – 10.15

Unit V: Chapter 7: 7.1 – 7. Chapter 9: 9.1 – 9.9, 9.20

Reference Books :

1. Charles Kiltel. (2004). Introduction to Solid State Physics. (8th ed.). Wiley India Pvt. Ltd.
2. Srivastava, J.P. (2015). Elements of Solid State Physics. (4th ed.). Prentice – Hall of India.
3. Ibach, H. Luth, H. (2009). Solid State Physics.(4th ed.). New York : Springer Berlin Heidelberg.
4. Wahab, M.A. (2011). Solid State Physics. (3rd ed.). New Delhi: Narosa Publications.

Semester V

Elective III (a): Programming with C++

Subject Code: PC1754

Number of hours per week	No of credits	Total number of hours	Marks
5	4	75	100

Objectives:

1. To apply C++ language to write simple programs for solving general Physics problems
2. To enable the students developing their own Applications using C++ and evolve as efficient software programmers

Unit I: Tokens, Expressions and Control Structures

Introduction – Tokens – Keywords – Identifiers and constants – Basic data types – User defined data types – Storage classes – Derived data types – Symbolic constants – Declaration of Variables – Dynamic initialization of variables – Reference variables – Operators in C++ - Scope resolution operator – Memory management operator

Unit II: Functions, Classes and Objects:

The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments – Constant arguments – Function overloading – Friend and virtual functions.Specifying a class – Defining member function – A C++ program with class – Making an outside Function inline - Nesting of member functions – Private member functions – Arrays within a class – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – Friendly functions

Unit III: Constructors, Destructors and Operator overloading:

Constructors – Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Dynamic constructors - Constructing two dimensional arrays – DestructorsDefining Operator overloading – Overloading Unary operators – Overloading Binary operators - Overloading Binary operators using friends – Manipulation of strings using operators – Rules for Overloading operators

Unit IV: Inheritance, Pointers and Virtual functions

Defining derived classes – Single inheritance - Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance.Pointers – Pointers to objects – Pointers to derived classes – Virtual functions – Virtual constructors and destructors.

Unit V: Managing console I/O operations and Working with files:

C++ streams – C++ stream classes – Unformatted I/O operations – Formatted console I/O operations – Managing output with manipulatorsClasses for file stream operations – Opening and closing a file – Detecting End of file –More about open (): file modes – File pointers and their manipulations

Text Book:

Balagurusamy, E. (2015). Object Oriented Programming with c++. (6th ed.). New Delhi: McGraw Hill Education (India) Private Limited.

Unit I : 3.1 – 3.9, 3.11 - 3.15, 3.17
Unit II : 4.1 – 4.8, 4.10 - 4.11, 5.1, 5.3 – 5.13,5.15
Unit III : 6.1 – 6.9, 6.11, 7.1 – 7.6, 7.8
Unit IV : 8.1 – 8.8, 9.1 – 9.3,9.5 – 9.6, 9.8
Unit V : 10.1 – 10.6, 11.1 – 11.6

Reference Book :

1. Ravichandran, D. (2008). Programming with C++.(3rd ed.).New Delhi: TataMcGraw Hill Publishing company Ltd.

Semester V
Elective III (b): Applied physics
Subject Code: PC1755

No of hours per week	No of credits	Total no of hours	Marks
5	4	90	100

Objectives: 1. To understand various concepts in medicine, astrophysics, communication, photography and videography.

2. To relate the principles and concepts of medicine, astrophysics, communication, photography and videography in day to day life.

Unit I: Medical physics

Sources of biomedical signals – Origin bioelectric signals – Electrocardiogram (ECG) – electro encephalogram (EEG) – Electromyogram (EMG) – Phonocardiograph (PCG) – Digital Stethoscope, Cardiac Pacemakers

Unit II: Space physics

Vital statistics of the sun – Solar photosphere – Fraunhoffer lines – Structure of solar atmosphere – Solar interior – Sunspots and solar activity – Radio studies of quiet sun – Gross properties of the earth – Internal structure of the earth – The earth's magnetic field – Asteroids – Meteorites – Comets as members of the solar system.

Unit III: Fibre optics

Physical nature of optical fibre – Fibre classification – Fibre splices, connectors and couplers – Manufacturing of fibre – Advantages and disadvantages of using optical fibre as communication medium – Application areas of optical fibre – Fibre optic communication system – Optical transmitter – Optical receiver – Optical repeater – Optical telecommunication system – Different optical telecommunication links – Technologies of the optical network services.

Unit IV: Photography and Videography

Camera – Mechanical and auto interchangeable lenses – Telephoto – Wide angle – Zoom and macrolenses – Developing of the film – Printing – Principle of television – Colour composite video signal – Colour television systems (PAL, SECAM, NTSC) – Video camera : Pick up device – Optical section – Charge coupled device (CCD) – Electronic shutter – Handling highlight – HAD sensor – Advantages, limitation, resolution of CCD – Digital signal processing in camera.

Unit V : Satellite communication

Basic characteristics of satellites – Advantages of Sattellite communication – Use of microwave frequencies- Digital transmission, compression and routing – Improves space platforms and launching systems – satellite orbit configurations – Evolution of satellite communication: SYNCOM- COMSAT – Specialized systems : DTH.

Text Books:

1. R.S. Khandhur, (2010). *Hand of biomedical Instrumentation*. (1st ed.). New York. Tata McGraw Hill Education Private Ltd.
   UNIT I: 1:1.4, 2.1, 2.1.1, 2.1.2, 2.1.3, 5.3, 5.4,25: 25.1-25.5
2. K.D. Abhyankar. (1999). *Astrophysics of the solar system*, (1st ed.). Hyderabad. University press Pvt. Ltd.
   UNIT II: 4.2 - 4.9 , 9.2, 9.3.
3. Anuradha De, (2003). *Optical fibre and laser – principles and applications*, (2nd ed.). New Delhi. New age international publishers.
   UNIT III: 2.2, 2.4, 2.7, 2.10, 2.11, 2.12, 4.3, 4.3.1- 4.3.3, 4.4, 4.4.1-4.4.2.
4. Paul Bedell, (2005). *Wireless Crash course*. (2nd ed.). New York Tata McGraw Hill Education Private Ltd.
5. Bruce R. Elbert, (2008) *Introduction to Satellite Communication*, Artech House Publication.
   UNIT V: 1.1: 1.1.1-1.1.4, 1.3, 2.1, 2.3: 2.3.1.

Reference books:

1. Leon W. Couch, (1988) *Modern communication systems*, New Delhi, India. Prentice Hall – India Pvt Ltd.
2. Killen,H.B.,(1988). *Digital communications with Fibre optic and satellite applications*, Prentice Hall International.

Semester V
Elective (c) : Bio Physics
Subject Code: PC1756

No of hours per week	No of credits	Total no of hours	Marks
5	4	75	100

Objective: 1. To use methods of physics to study biological process.
2. To understand the applications of biophysics in the field of medicine.

Unit I: Molecules of life:

Metabolites - proteins and nucleic acids - Their sizes - Types and roles in structures and processes – Transport - Energy storage - Membrane formation – Catalysis – Replication - Transcription – Translation - Signaling.

Unit II: Mathematical Model:

Typical populations of molecules of various types present in cells - Their rates of production and turnover - Energy required to make a bacterial cell - Simplified mathematical models of transcription and translation - Small genetic circuits and signaling pathways - Random walks and applications to biology – Mathematical models to be studied analytically and computationally.

Unit III: The level of a cell:

The numbers of distinct metabolites - Genes and proteins in a cell - Complex networks of molecular interactions: metabolic - Rregulatory and signalling Networks - Dynamics of metabolic networks - the stoichiometric matrix - Living systems as complex organizations - systems biology - Models of cellular dynamics – The implausibility of life based on a simplified probability estimate, and the origin of life problem.

Unit IV: The complexity of life:

At the level of a multicellular organism: Numbers and types of cells in multicellular Organisms - Cell types as distinct attractors of a dynamical system - Stem cells and cellular differentiation - Pattern formation and development - Brain structure: neurons and neural networks. Brain as an information processing system.

Unit V: Evolution:

The mechanism of evolution: variation at the molecular level - Selection at the level of the organism - Models of evolution - The concept of genotype-phenotype map.

Text Books:

1. Kim Sneppen, Giovanni Zocchi. (2005). *Physics in Molecular Biology.*
2. Chapman, Hall, Uri Alon. (2013). *An Introduction to Systems Biology*. (Special Indian ed.)
3. M. Ridley. (2009). Evolution. (3rd ed.),) Blackwell Publishers.

References:

1. Philip Nelson. (2004). *Biological Physics – Energy*. Information, Life. New York: W H Freeman & Co.
2. Rob Phillips et al. (2013). *Physical Biology of the Cell.* (2nd Ed.), London & NY: Garland Science, Taylor & Francis Group.

Semester V

Skill Based Course
Basic Electrical circuits and applications

No of hours per week	No of credits	Total no of hours	Marks
2	2	30	100

Objectives: 1. To acquire knowledge on the basis of electrical parameters and circuits, electrical wiring, electrical instruments appliances used in daily life and to understand the concept of power generation.

2. To develop basic trouble shooting skills in domestic appliances.

Unit I: Electrical quantities

Introduction to Electricity - Current - Voltage - Resistance - Ohm's Law - DC Circuit - Series Circuits - Parallel Circuits- AC Voltage - Magnetism & Electromagnetism – Alternating Current (AC) - Sine Waves - AC vs. DC - AC Voltage - Sine Wave Values - Electric Power- Calculating Power - Kilowatt .

Unit II: Circuit elements and Power generation

Symbols of electrical elements - Resistors - Conductors - Inductor – Capacitor and transformer - Single phase and three phase - Star and delta connections - Rules of electric connections - Generation of electric power by thermal, hydro, and nuclear methods - Battery - Study of motors and Generators.

Unit III: Electrical Wiring

Systems of supply – Systems of wiring – Testing of wiring installation – Materials used for wiring – A lamp controlled by a switch – Number of lamps each controlled by its switch – Staircase connection – Earthing - Lamp holders, sockets - Fuse base - Distribution box –Trip switches - Earth connection - House wiring - Experimental study of main, distribution and switch boards.

Unit IV : Electrical Instruments and appliances

Voltmeter, Ammeter, Multimeter - Incandescent lamp- Fluorescent bulb, Choke and Starter – Electric Iron – Emergency lamp – Heater - Ceiling fan - Microphone – amplifier - Loudspeaker – Thermistor – LDR - LED – Electronic switch using transistor and relay - Battery eliminator.

Hands on training

a. Uses of tester &Multimeter.
b. A lamp controlled by a switch with fuse circuit. A lamp controlled by two switch
c. Calling bell.
d. Florescent lamp wiring and testing
e. Music bell
f. LDR application.
g. Working of a relay
h. Microphone – amplifier – Loudspeaker setup

Text Books:

Course material prepared by the Department.

Reference Book:

1. Arnold,R.B.(1986). *A first electronics course*. (1st ed.). Cheltenham, England: Stanley Thornes (Publishers) Ltd.
2. Theraja, B. L. (2002). *A text book in Electrical Technology*. (23rd ed.). New Delhi: S. Chand and Company

Semester VI

Major Core VIII: Mathematical methods of Physics

Subject Code: PC1761

No of hours per week	No of credits	Total no of hours	Marks
6	5	90	100

Objective: 1. To emphasize the use of mathematical tools which help in solving problems in physics.

2. To train topics in vector analysis, matrices, differential equations and Fourier analysis.

Unit I: Vector Analysis

Point function – Scalar field – Vector field – Gradient of a Scalar field – Physical interpretation – Lamellar Vector field – line, surface and volume integrals – Divergence of a vector function – Expression for divergence in Cartesian coordinates –Curl of vector function – Expression for curl in Cartesian coordinates – Physical significance of curl – Gauss divergence theorem – Green's theorem .

Unit II: Matrices

Eigen values - Eigen vectors – Characteristic equation of a matrix – Cayley – Hamilton theorem – Theorems on eigen values and eigen vectors – Diagonalization of matrices – Special type of matrices – Inverse of a matrix – Non-homogenous linear equations – Cramer's rule for solving non-homogenous linear equations

Unit III: Differential Equations

First order equations – Variables are separable – Homogenous equations – Non – homogenous equations reducible to homogenous ones – Linear differential equations – Equations of first order and higher degrees – Physical examples: Radioactive decay process.

Unit IV: Fourier Analysis

Harmonic oscillations – Harmonic synthesis and analysis – Fourier contribution – Fourier series –Dirichlet's theorem – Fourier coefficients – Fourier cosine and sine series – Symmetry – Complex form of Fourier series – Change in interval of expansion – Applications of Fourier series: Sawtooth wave - Half wave rectifier – Full wave rectifier.

Unit V: Random Variables and Probability

Random Variables – Simple random sample – Mean – Median – Mode – Dispersion – Elementary properties of probability – Conditional probability – Addition rule of probability – Multiplication law of probability – Probability distribution – Mean, variance and standard deviation of Poisson distribution.

Text Books:

1. Murugeshan, R. (2014). *Mechanics and mathematical Physics*. New Delhi: S. Chand & Company Pvt. Ltd.
   Unit I: Chapter: 7, Sections: 7.1 – 7.8, 7.10, 7.12
   Unit II:Chapter: 8 and 12: 12.1 – 12.3

2. Gupta, A.B. (2010). *Fundamentals of Mathematical Physics*. Kolkata: ArunabhaSen Pvt. Ltd.
Unit III: Chapter 6, sections 6.2 (1 - 5), 6.3, 6.4.2.1
Unit IV: Chapter 11, sections 11.2, 11.3 (1 – 5), 11.4.1
Unit V: Chapter 15, sections 15.1, 15.2(1 – 3), 15.3 – 15.9

Reference Books:

1. Arfken, G.B. & Weber, H.J., Harris, F.E., (2013).*Mathematical Methods for Physicists*. (7^{th} ed.). Noida. Elsevier.
2. George, F. & Simmons, (1991). *Differential Equations*. (2^{nd} ed.). New York McGraw Hill.
3. James Nearing, (2010). *Mathematical Tools for Physics*. (3^{rh} ed.). New York. Dover Publications.
4. Zill, D.G. & Wright, W.S. (2012). *Advanced Engineering Mathematics*. (5^{th} ed.), Burlington. Jones and Bartlett Learning.

Semester VI
Major core IX: Digital Systems and Applications
Subject Code: PC1762

No. of Hours per week	No of Credits	Total no of Hours	Marks
6	5	90	100

Objectives: 1. To understand the different concepts in digital electronics, digital devices and applications.

2.To prepare students to perform the analysis and design of various digital electronic circuits.

Unit I : Logic gates and Boolean Algebra

Universal logic gates – NOR, NAND – De Morgan's theorems – Positive and negative logic – Boolean laws and theorems – Sum of products method – truth table to Karnaugh map (Three variable and Four variable maps) – Karnaugh simplifications – Don't care conditions – Product of sums method – Product of sums simplification.

Unit II : Number System

Binary number system – Binary to decimal conversion – Decimal to binary – Octal numbers – Hexadecimal numbers – Binary addition – Binary subtraction – 1^s and 2s complement method – Arithmetic building blocks – Half adder and full adder (truth table and Karnaugh map).

Unit III : 555 timer and flipflops

555 timer – Monostable multivibrator – Astable multivibrator – Frequency divider – Logic gate flip flop – R-S flip flop – Clocked R-S flip flop – J-K flip flop – R-S master slave flip flop – J-K master – Slave flip flop – D flip flop.

Unit IV : Registers and Counters

Types of registers – Serial In - Serial Out – Serial In - Parallel Out – Parallel In - Serial Out – Paralle In – Paralle Out - Ring counter – Decade counter: A MOD -5 counter – Shift counter – Shift counter Modulus.

Unit V : A-D and D-A converters

Analog to digital conversion, Digital to Analog conversion – A-D converter – Multiplexer – De multiplexer – Encoder: Decimal to BCD encoder – Decoders : BCD to decimal decoder – Differential instrumentation amplifier – Transducer – Instrumentation amplifier using Transducer Bridge – Temperature indicator – Analog weight scale.

Text Books:

1. Donald .P. Leach, Albert Paul Malvino, Goutam suba, (2006). *Digital Principles and Applications.* (6^{th} ed.). New Delhi: Tata, Mc Graw Hill publishing company.
   Unit I: Section – 2.2, 2.4, 3.1 to 3.3, 3.5 to 3.8
   Unit II : Section – 5.1 to 5.5, 6.1, 6.2, 6.7
2. G. Jose Robin and A. Ubald Raj. (2005). *Applied Electronics*. (1^{st} ed.). Marthandam: Indira publication.
   Unit III : Chapter – 3
   Unit V : Chapter – 5
3. Donald P Leach, Albert Paul Malvino. (2002). *Digital principles and application*. (5^{th} ed.). New Delhi: Tata Mc Graw Hill Publishing Company Ltd.
   Unit IV: Section : 9.1 – 9.6, 10.5, 10.7

Reference Books

Malvino, A.P. and Brown, J.A. (1997). *Digital Computer Electronics*. (3^{rd} ed.). New Delhi: Tata McGraw Hill Publishing Company

Question papers should have 20% weightage for problems in Part B.

Semester VI

Major core X: Nuclear Physics

Subject Code: PC1763

No of hours per week	No of credits	Total no of hours	Marks
5	5	90	100

Objective: 1. To enable the students to understand the properties, models and radioactive reaction of the nucleus.

2.To create awareness on nuclear reactions such as fission, fusion, radiation detectors and elementary particles so that students can shine.

Unit I : Properties of Nuclei

Constituents of nuclei - Isotopes, Isobars, Isotones and mirror nuclei - Nuclear mass and binding energy - Unit of atomic mass - Binding energy and stability of nucleus - Mass defect and packing fraction - Binding fraction Vs mass number curve - Nuclear size - Nuclear spin - Nuclear energy levels - Nuclear magnetic moment - Parity of nuclei - Nuclear quadrupole moment - Statistics of nuclei - Nuclear forces - Liquid drop model - Semi-empherical mass formula - Shell model.

Unit II : Radioactivity

Radioactivity - Radioactive reactions - Radioactive decay law - Statistical nature of radioactivity - Activity or strength of a radio-sample - Radioactive decay : Conservation laws - Radioactive series: Displacement law - Successive transformation – Radioactive equilibrium - Radioactive dating: Age of minerals, rocks - Alpha decay - Beta decay - Gamma decay.

Unit III : Nuclear Reactions

Nuclear Reactions: Basics - Conservation laws in nuclear Reactions - Energetics of nuclear Reactions - Crosssection of nuclear Reactions - Reaction mechanisms - Nuclear fission - Energy released in fission of U-235 - Liquid drop theory of fission - Nuclear chain reaction - Nuclear Reactor - Types of reactor - Breeder reactor - Fission bomb - Fusion: Thermo nuclear reaction - Source of stellar energy: Natural fusion - Uncontrolled fusion: Hydrogen bomb.

Unit IV : Radiation Detectors and Particle Accelerators

Introduction - Ionisation chamber - Proportional counter - Geiger Muller counter - Neutron detection - Cloud chamber - Scintillation counter - Photographic detection - Solid state track detector - Semiconductor detector - Particle accelerators - Linear accelerator - Cyclotron - Synchro cyclotron - Betatron .

Unit V : Elementary Particles

Introduction - Fundamental Interactions - Pions and Muons - K mesons - Hyperons - Antiparticles - Classification of elementary particles - Conservation laws - CPT theorem - Resonance particles - Symmetry classification of elementary particles - Quark model Unification of interactions - The standard model.

Text Books:

1. Gupta, A.B. (2015). *Modern Physics*. (2nd ed.). New Delhi: Books and Allied (P) Ltd.

Unit I: Chapter 18 : 18.1-18.3, 18.5-18.16, 18.17, 18.18, 18.18.1, 18.19, 18.19.1 - 18.19.4

Unit II: Chapter 19 : 19.1 - 19.9, 19.11

Unit III: Chapter 20: 20.1-20.16

Unit IV: Chapter 21: 21.1-21.5, 21.7, 21.7.1, 21.7.2, 21.9, 21.11-21.16, 21.17.2, 21.18

Unit V: Chapter 22: 22.1-22.9, 22.10, 22.11-22.14

2. Arthur Beiser. (2006). *Concepts of Modern Physics*. (6th ed.).New Delhi: Tata McGraw - Hill Edition,

Unit II: Chapter 12: 12.4-12.6, Appendix (theory of alpha decay)

Reference Books:

1. Tayal D.C. (2002). *Nuclear Physics*. (1st ed.). New Delhi: Himalaya Publishing House.

2. Roy R.R. and Nigam B.P. (1983). .*Nuclear Physics*, (2nd ed.). Bangalore: New age International Ltd.

3. SatyaPrakash, (2004). *Nuclear Physics and Particle Physics*. (1st ed.). New Delhi: S. Sultan Chand & Sons Publications.

Semester VI

Elective – IV (a): Nanomaterials and its Applications

Subject Code: PC1764

No of hours per week	No of credits	Total no of hours	Marks
5	4	75	100

Objectives : 1. To gain knowledge on synthesis and characterization of nanomaterials.
2.To understand the advancements and applications of nanostructures.

Unit I : Introduction to nanotechnology

History of nanotechnology – Techniques in nanotechnology – Scientific Revolutions – Dimensions of nanostructures – One dimensional nanoscale– Two dimensional nanoscale – Three dimensional nanoscale– What makes 'nano' special? – Size matters – Nanocrystals – Length scale of Nanomaterials **–** Classificationof nanomaterials : Fullerenes, nanoparticles , nanorings, nanorods, nanoshells – Properties of nanoparticles over other materials

Unit II : Nanostructure Materials Synthesis and Characterization

Synthesis of nanomaterials: Plasma arcing, Chemical vapour deposition, sol-gel method, electro-deposition, ball milling – Properties of nanoparticles : Physical , chemical , electrical, optical , magnetic and mechanical properties – Nanocomposites – Characterization of nanomaterials – X-ray diffraction (XRD) –Scanning Electron Microscope (SEM) – Transmission Electron Microscope (TEM) – Analytical Electron Microscope – Significance of nanoparticles – Applications of nanomaterials – Applications of nanotechnology.

Unit III : Quantum wells, Quantum wires and Quantum Dots

Introduction – Potential well – Quantum well – Particle in a box – One-dimensional box – Two-dimensional box – Three-dimensional box –Superlattices– Types of Superlattices– Applications of quantum wells –Quantum wire – Density of States (3D, 2D, 1D, 0D) –Quantum dots – Electrons in mesoscopic structures.

Unit IV : Carbon Nanotubes

Discovery of nanotubes –Allotropes of carbon – Structure of carbon nanotubes – Categories of carbon nanotubes : Tours – Buckminster fullerene – Carbon nanohorns – Fullerite – Nanobud–Synthesis of carbon nanotubes: Laser method – Electrolysis – Chemical Vapour Deposition (CVD) –Purification of carbon nanotubes and fullerene –Applications of carbon nanotubes.

Unit V: Applications of Nanotechnology

Applications of nanomaterials and Nanowires – Solar power using nanotechnology: Solar cells, Plastic solar cells – Nanotechnology in textiles – Applications of nanocomposites –Nano optics – Nanotechnology in communication field – Quantum dot laser – Photonic crystals – MEMS – Mechanical oscillators – Thin film Optics

Text Books:

1. Manasi Karkare. (2008). *Nanotechnology: Fundamentals and applications*. (1 st ed.). Mumbai: I.K. International publishing house.

   UNIT I : Relevant topics in chapters 1& 2

UNIT V: Relevant topics in chapters 3,6,7,8,11 and 12

2. Palanisamy. P.K (2012). *Engineering Physics.* (1st ed.). India: SciTech Publications Pvt.Ltd,

   UNIT II: Chapter 5 : 5.2, 5.4, 5.4.1-5.4.5, 5.5, 5.5.1 – 5.5.2, 5.6, 5.6.1-5.6.5, 5.7, 5.7.1-5.7.6, 5.8, 5.9

3. Sr. Gerardin Jayam. (2010). *Basic Nanophysics.* (1st ed.). Nagercoil: Dept. of physics, Holy Cross College.

   UNIT III: 2.1, 2.2, 2.2.1, 2.3, 2.3.1- 2.3.3, 2.4, 2.4.1, 2.5, 2.6, 2.7, 2.7.1-2.7.3, 2.8, 2.9

   UNIT IV: 3.1, 3.2, 3.3, 3.4, 3.4.1, 3.5, 3.5.1-3.5.3,3.6,3.6.1-3.6.3, 3.7, 3.8.

Reference Books:

1. Charles P. Poole Jr & Frank J. Owens.(2008). *Introduction to Nanotechnology* . (1st ed.). Germany: Wiley publications.

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2. Mohankumar . G. (2016). *Nanotechnology-Nanomaterials and Devices*. (1st ed.).New Delhi: Narosa publishing House.

Semester VI

Elective IV (b): Basic Astrophysics
Subject Code: PC1765

No of hours per week	No of credits	Total no of hours	Marks
5	4	75	100

Objectives: 1. To enable the students to understand the historical evolution of Astrophysics and principles involved in Astrophysics.

2. The topics included are sun, stellar evolution, comets and the milky way galaxy which play a key role in employability and global progress of students

Unit I: General Introduction

Historical development of Astronomy – Observational methods and scope of Astronomy – physical properties – apparent and absolute magnitude – luminosity – measurements of distances, mass, radius etc. of stars.

Optical telescope – resolving power – light gathering power of a telescope mounting – different types of telescope.

Unit II: Sun

Physical characteristics – sources and transport of energy atmosphere – chromospheres – solar corona – sunspots – limb darkening – solar cycle – solar magnetic field – plasma eruptions – solar flares.

Unit III: Stellar Evolution

Stellar structure – protostar – main sequence – red giant white dwarfs – supernova – planetary nebulae – neutron stars – black holes

Unit IV: Peculiar Objects

Variable stars – cephid variables – distance estimates – ALGOL – binaries pulsars – quasars – multiple stars – globular clusters – Comets – meteroids – asteroids – Chiron

Unit V: Galaxies

Our Galaxy – different types of galaxies – groups of galaxies – motion of galaxies – super cluster – large scale – structure of the universe.

Structure of Milky wave galaxy – nebulae – center of our galaxy – higher energy sources in our galaxy.

Text Books :

Abhayankar, K.D. (1999). *Astrophysics of the solar systems*, (1st ed.). New Delhi: University Press (India) Private Limited.

Unit I : Chapter 1: 1.1 to 1.9
Unit II : Chapter 4: 4.1 to 4.10
Unit III : Chapter 10: 10.1 to 10.6
Unit IV : Chapter 9: 9.1 to 9.11
Unit V : Chapter 11: 11.1 to 11.7

Reference Books:

1. Krishnaswamy, K.S. (1996). *Astrophysics – A modern perspective*. (1st ed.). Bangalore: New age Int. Lt. Publication.
2. Robert Robins., William Jefereys. (1998). *Discovering Astronomy.* (1st ed.). New York: Wiley Publication.
3. Jay M. paschoff. (1992). *Contemporary Astronomy* . (1st ed.). New Delhi: Tata McGraw Hill Publication.

Semester VI

Elective IV (c) : Digital Signal Processing (Elective - IV)
Subject Code: PC1766

No of hours per week	No of credits	Total no of hours	Marks
5	4	75	100

Objectives: 1. To introduce signals systems, time and frequency domain concepts and the associated mathematical tools that are fundamental to all DSP techniques
2.To provide a through understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals.

Unit I: Discrete-Time Signals and Systems:

Classification of Signals - Transformations of the Independent Variable - Periodic and Aperiodic Signals - Energy and Power Signals – Even and Odd Signals - Discrete-Time Systems - System Properties. Impulse Response - Convolution Sum - Graphical Method - Analytical Method - Properties of Convolution - Commutative – Associative – Distributive – Shift - Sum Property System Response to Periodic Inputs - Relationship Between LTI System Properties and the Impulse Response – Causality – Stability – Invertibility - Unit Step Response.

Unit II: Discrete-Time Fourier Transform:

Fourier Transform Representation of Aperiodic - Discrete-Time Signals - Periodicity of DTFT - Properties – Linearity - Time Shifting - Frequency Shifting - Differencing in Time Domain - Differentiation in Frequency Domain - Convolution Property. **The *z*-Transform:** Bilateral (Two-Sided) *z*-Transform - Inverse *z*-Transform - Relationship Between *z*-Transform and Discrete-Time Fourier Transform - *z*-plane.

Unit III: Filter Concepts: Phase Delay and Group delay - Zero-Phase Filter - Linear-Phase Filter - Simple FIR Digital Filters - Simple IIR Digital Filters - All pass Filters - Averaging Filters - Notch Filters.

Unit IV: Discrete Fourier Transform:

Frequency Domain Sampling (Sampling of DTFT) - The Discrete Fourier Transform (DFT) and its Inverse - DFT as a Linear transformation,Properties – Periodicity – Linearity - Circular Time Shifting - Circular Frequency Shifting- Circular Time Reversal - Multiplication Property - Parseval's Relation - Linear Convolution Using the DFT (Linear Convolution Using Circular Convolution) - Circular Convolution as Linear Convolution with aliasing.

Unit V: Fast Fourier Transform:

Direct Computation of the DFT - Symmetry and Periodicity Properties of the Twiddle factor (W_N) - Radix-2 FFT Algorithms - Decimation-In-Time (DIT) FFT Algorithm - Decimation-In-Frequency (DIF) FFT Algorithm - Inverse DFT Using FFT Algorithms. **Realization of Digital**

Filters: Non Recursive and Recursive Structures - Canonic and Non Canonic Structures - Equivalent Structures (Transposed Structure) - FIR Filter Structures - Direct-Form - Cascade-Form - Basic structures for IIR systems - Direct-Form I.

Text Books:

1. Tarun Kumar Rawat. (2015). *Digital Signal Processing*. India: Oxford University Press.
2. Mitra, S. K. (2009). *Digital Signal Processing*. India: McGraw Hill.
3. Lathi, B.P. (1998). *Modern Digital and Analog Communication Systems*. (3rd ed.). India: Oxford University Press.

Reference Books:

1. Schilling, R.J. Harris, S.L. (2005). *Fundamentals of Digital Signal processing using MATLAB.* Cengage Learning.
2. Cha, P.D. Molinder J.I. (2007). *Fundamentals of signals and systems*. Cambridge University Press.
3. Proakis, J.G. Manolakis, D.G. (2007). *Digital Signal Processing Principles Algoritham & Applications.* (4th ed.). Prentice Hall.

Semester V
Physics Lab – V

Subject Code: PC17P5

No of hours per week	No of credits	Total no of hours	Marks
4	2	60	100

Objectives : **1.** To demonstrate the fundamental principle of optics.
2.To determine the behavior of a ray at any optical surface (lenses, Prisms)

Any fourteen experiments

1. Refractive Index of material of prism using Sodium light.
2. Dispersive power of material of prism using Mercury light.
3. Cauchy's constant.
4. Hartmann's interpolation formula.
5. Newton's rings.
6. i – i' curve.
7. Air Wedge.
8. Wavelength of spectral lines of Mercury light with grating in oblique incidence.
9. Biprism.
10. Elliptical fringes.
11. i – d curve.
12. Hyperbolic fringes.
13. Hollow prism.
14. Specific rotatory power using Polarimeter.
15. Spectrometer – Grating – Normal Incidence.
16. Spectrometer – Grating – Minimum deviation.
17. Spectrometer – Grating – Rydberg constant.

Semester V
Physics Lab – VI

Subject Code: PC17P6

No of hours per week	No of credits	Total no of hours	Marks
4	2	60	100

Objectives: 1. To demonstrate the basic logic gates, understand Boolean algebra and simplify simple Boolean functions by using basic Boolean properties
2.To Understand, analyse and design various combinational and sequential circuits (Flip flop, Counters, Encoder, Decoder etc.)

Any fourteen experiments

1. IC – 555 – Astablemultivibrator
2. IC – 555 – Monostablemultivibrator
3. Half & Full Adder
4. Universality of NOR
5. Universality of NAND
6. Flip – Flop (RS)
7. Flip – Flop (JK)
8. Logic gates – Using discrete components (OR, AND, NOT)
9. Verification of Boolean expressions and DeMorgan's Laws.
10. Decoder
11. Encoder
12. Half & Full Subtractor
13. Regulated Power Supply Using IC's
14. Up, Down Counter
15. Multiplexer
16. Schmidt trigger – IC 555

Semester V
Physics Lab – VII

Subject Code: PC17P7

No of hours per week	No of credits	Total no of hours	Marks
4	2	60	100

Objectives: 1. To apply object oriented programming techniques to solve computing Problems.
2. To develop programs using functions and classes (objects, array of objects, friend functions, passing and returning objects).

Any fourteen experiments

1. To read any two numbers through the key board and to perform simple arithmetic operation (addition, subtraction, multiplication and division) and display the results using Cin and Cout functions. Use do-while loop.

2. To display the name of the day in a week, depending upon the number entered through key board using Switch-Case statement

3. To test the validity of any entered character whether it belongs to the alphabetical set or a number or a special character

4. To find the sum of the series using for loop.
   a) Sum = 1 + 3 + 5 + ... n
   b) Sum = $x - x^3/3! + x^5/5! - x^7/7! + \ldots\ldots x^n/n!$
   c) Sum = $1 + 2^2 + 4^2 + \ldots\ldots + n^2$

5. To find the factorial of a number by using function declaration with/without using the return statement

6. To read a set of numbers from a standard input device and to find out the largest number in the given array using function declaration. Also sort them in the ascending or the descending order.

7. To read the elements of the given two matrices of order m x n and to perform the matrix addition and display the transpose of the result.

8. a) To display the content of any array using pointer arithmetic
   b) To read the data variables (such as Day, Month, Year) of a class by the member function and display the content of class objects on the screen in the format DD/MM/YYYY

9. To generate a series of Fibonacci numbers using constructor where the constructor member function has been defined in the scope of class definition / out of the class definition using the scope resolution operator.
10. To read the following information from the keyboard in which basic class consists of Name, Roll No. and Sex. The derived class contains the data members height and weight. Display the contents of the class using inheritance concept.

11. To write a LOOP programme to find the period of a pendulum of given length L, in a

gravitational field. Accept the required values using the keyboard. Also display the result.

12. Develop a program in C++ to calculate the Young's modulus of a material from the data obtained from uniform bending method.
13. Define a class to represent a bank account Data members:
    1. Name of the depositor
    2. Account Name
    3. Type of Account
    4. Balance amount in the account.

    Member function
    1. To assign initial values
    2. To deposit an amount
    3. To withdraw an amount
    4. To display name and balance.

14. Solve quadratic equation

15. Multiplication of two matrices

16. Write a program that uses functions to compare two strings input by the user. The program should state whether the first string is less than, equal or greater than the second string.