

**GOVERNMENT COLLEGE FOR WOMEN
(AUTONOMOUS)
KUMBAKONAM-612 001**



**UG REVISED SYLLABUS
EFFECTIVE FROM 2018-2019
ONWARDS**

DEPARTMENT OF PHYSICS

2018 - 2019

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)
KUMBAKONAM
UG REVISED SYLLABUS 2018-2019 ONWARDS

SEME STER	COURSE TITLE	COURSE CODE	TITLE OF THE PAPER	INST RU. HRS	C R E D I T	MAR KS
I	Part-I Language	17GT1	Tamil	6	3	100
	Part-II Language	17GE1	English	6	3	100
	Part- III Core Course- I	18PHC101	Properties of Matter & Sound	6	5	100
	Part- III Core Course- II	18PHC202P1	Major Practical -I	3	-	-
	Part- III – Allied Course -I	171AM1	Mathematics	5	4	100
	Part- III – Allied Course -II	172AM2	Mathematics	4	3	-
				TOTAL	30	18
II	Part-I Language	17GT2	Tamil	6	3	100
	Part-II Language	17GE2	English	6	3	100
	Part- III Core Course- III	18PHC203	Mechanics & Relativity	5	5	100
	Part- III Core Course- II	18PHC202P1	Major Practical I	3	4	100
	Part- III – Allied Course -II	172AM2	Mathematics	2	3	100
	Part-III – Allied Course -III	172AM3	Mathematics	4	4	100
	Part-IV	UGCES	Environmental Studies	2	2	100
	Part-IV	18UVE	Value Education	2	2	100
			TOTAL	30	26	800
III	Part-I Language	17GT3	Tamil	6	3	100
	Part-II Language	17GE3	English	6	3	100
	Part- III Core Course- IV	18PHC304	Thermal and statistical physics	6	5	100
	Part- III Core Course- V	18PHC405P2	Major Practical-II	3	-	-
	Part- III – Allied Course-IV	183CH1	Chemistry	5	4	100
	Part- III – Allied Course -V	183CH2P	Allied Practical	2	-	-
	Part-IV- Non-Major Elective Course-I	18PH3NMEC 1	Physics made Easy	2	2	100

			TOTAL	30	17	500
IV	Part-I Language	17GT4	Tamil	6	3	100
	Part-II Language	17GE4	English	6	3	100
	Part- III Core Course- V	18PHC405P2	Major Practical-II	3	4	100
	Part- III Core Course- VI	18PHC406	Optics	4	5	100
	Part- III – Allied Course –V	184ACH2P	Chemistry Practical	3	4	100
	Part- III – Allied Course-VI	184ACH3	Chemistry	4	4	100
	Part –IV-Non-Major Elective Course-II	18PH4NMEC 2	Simple Appliances	2	2	100
	Part-IV-Skill Based Elective Course -I	SBEA	Electrical Appliances	2	2	100
TOTAL				30	27	800

V	Core Course- VII	18PHC507	Electricity And Magnetism	5	5	100
	Core Course- VIII	18PHC508	Atomic Physics	5	5	100
	Core Course- IX	18PHC509	Basic Electronics	5	5	100
	Core Course- X	18PHC510P3	Major Practical-III	6	4	100
	Major Based Elective- I	18PH5EC3:1 18PH5EC3:2	1.Spectroscopy And Laser Physics 2.Solid state and Material science	4	3	100
	Part-IV-Skill Based Elective Course -II	SBMP	Medical Physics	2	2	100
	Part-IV-Skill Based Elective Course -III	SBAV	Audio and Video Systems	2	2	100
	TOTAL				29	26
VI	Core Course- XI	18PHC611	Wave Mechanics & Nuclear Physics	6	5	100
	Core Course- XII	18PHC612	Solid State Physics	6	5	100
	Core Course- XIII	18PHC613P4	Major Practical-IV	6	4	100
	Major Based Elective- II	18PH6EC4:1 18PH6EC4:2	1.Integrated Electronics 2.Electrical and electronics instrumentation	4	3	100
	Major Based Elective- III	18PH6EC5:1 18PH6EC5:2	1.Computer Programming-C Language 2.Microprocessor and Microcontroller	5	4	100
	Extension Activities		-	-	1	-
	Part-V	18UGS	Gender Studies	1	1	100
PART-III	U23NM6ER	Naan mudhalvan course-	2	2	100	

			Employability Readiness			
	SSC –I	USSC1	Mathematical Aptitude for Recruitment Board Examination.	1	1	
			TOTAL	31	26	700
			GRAND TOTAL	180	140	3900

Total No. of Papers : 39
Total hours : 180
Credit : 140
Extension Activities : 01
Marks : 3900

Allied and Applied courses offered to other departments

- Mathematics
- Chemistry
- Computer science

CCI: PROPERTIES OF MATTER AND SOUND

SEMESTER I

CREDIT : 5

INS. HRS. : 6

OBJECTIVE:

- To understand the basic properties and concept of matter and sound.

UNIT – I ELASTICITY

Stress – Strain diagram – Elastic moduli, work done per unit volume in shearing – Relation between elastic constants –Poisson's Ratio – Expression for Poisson's Ratio in terms of elastic constants –Twisting couple on a wire – Work done in twisting – Torsional Pendulum –determination of rigidity modulus of a wire.

UNIT – II BENDING OF BEAMS:

Expression for bending moment- Cantilever- Expression for depression- Experiment to find Young's modulus- Cantilever oscillation- Expression for period – Uniform bending- Expression for elevation- Experiment to find Young's modulus using microscope – Non Uniform bending – Expression for depression – Experiment to determine Young's modulus using mirror and telescope.

UNIT –III SURFACE TENSION

Definition and dimensions of surface tension – surface energy – Excess of pressure over curved surfaces- Variation of surface tension with temperature – Jaeger's experiment – Determination of surface tension by capillary rise method.

LOW PRESSURE

Production and measurement of low pressure – Gaede molecular pump – Kundsen's absolute gauge – Detection of leakage.

UNIT-IV: VISCOSITY

Streamlined motion – Turbulent motion – Coefficient of viscosity and its dimension –Rate of flow of liquid in a capillary tube – Poiseuille's formula – Experiment to determine the coefficient of viscosity of liquid – Terminal velocity- Stoke's Experiment .

UNIT-V: SOUND

Free and damped oscillations - origin of sound - Material medium - Velocity of longitudinal waves in gases - Newton's formula for velocity of sound - Effect of pressure, temperature and density of medium - wind and humidity - velocity of sound in water, air - Beats - Helmholtz resonator-velocity of transverse waves in strings - Reverberation time - Sabine's formula.

BOOKS FOR STUDY:

1. Properties of Matter – Brijlal and Subramanian, S.Chand & Company Pvt. Ltd (2001).
2. A text book of Sound – N. Subramanian and Brijlal, Vikas Publication House Pvt Ltd; Second edition (1999).
3. Properties of Matter and Acoustics by R.Murugesan, S.Chand & Company Pvt. Ltd. (2013).
4. Elements of Properties of Matter by D.S.Mathur, S.Chand & company Pvt. Ltd (1968).

BOOKS FOR REFERENCE:

1. Properties of Matter – D.S Mathur, S Chand & Company (2010).
2. Properties of Matter – Subramania Iyer and Jeyaraman
3. Oscillators, Waves and Sound – L.Sharma, H.C.Saxena
4. A Text book of Sound – R.L. Singal.

CC-II MAJOR PRACTICALS – I

SEMESTER II

CREDIT : 4

Internal: 40 External: 60

INSTRU.HRS. : 3

(Any Twelve Experiments only)

1. Non-uniform bending-pin and Microscope
2. Uniform bending- Single Optic liver
3. Surface tension-Capillary rise method
4. Determination of Relative Density of solid and liquid using sonometer
5. Melde's experiment-Transverse and longitudinal mode of vibration
6. Compound Pendulum-g and k
7. Cantilever depression-scale and telescope
8. Specific heat capacity of a liquid-Newton's Law of cooling
9. Thermal conductivity of a bad conductor-Lee's disc method
10. Long focus convex lens-f,R, μ
11. Concave lens-r,R, μ
12. Spectrometer- μ of a solid prism
13. Air wedge- thickness of insulation
14. P.O.Box-Temperature coefficient of the given coil
15. Viscosity-Poiseuille's flow of method
16. Surface Tension-Drop Weight Method.

BOOKS FOR REFERENCE

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Trichy.
2. A Text Book of Practical Physics C.C Ouseph, C.Rangarajan, R.Balakrishnan and S.Viswanathan, Publisher-Part II (1996)
3. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25th Edition (2002)

CC-III-MECHANICS AND RELATIVITY

SEMESTER II

CREDIT : 5

INS. HRS. : 5

OBJECTIVES:

- To understand the concept of static and dynamic nature of physical systems.
- To understand the basic concepts of relativity.

UNIT I: DYNAMICS OF PROJECTILE, IMPULSE AND IMPACT

Projectile – range of horizontal and inclined plane-Impulse- Impact- Impulsive force – Laws of impact _ Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impact-Loss in kinetic energy-Motion of two interacting bodies-Reduced mass.

UNIT II: DYNAMICS OF RIGID BODIES

Kinetic energy of rotation-Theory of Compound Pendulum-Equivalent simple pendulum-Reversibility of centre of oscillation and suspension-Determination of g and radius of gyration of a bar pendulum-Period of oscillation of Bifilar pendulum with and without parallel threads. Centre of mass-Velocity and acceleration of centre of mass-determination of motion of individual particles-system of variable mass-equation for Rocket-Conservation of linear momentum and angular momentum.

UNIT III: GRAVITATION AND CENTRE OF GRAVITY

Gravitational potential and field due to spherical shell-Gravitational energy-Boy's method of G -Centre of gravity of a solid and hollow tetrahedron, solid and hollow hemisphere-Stability-Types of Equilibrium-Banking of curves.

UNIT IV: CENTRE OF PRESSURE

Vertical rectangular lamina –Vertical triangular lamina-Vertical circular lamina-Atmospheric pressure-its variation with altitude-Reasons for such variation.

HYDRODYNAMICS

Equation of continuity of flow-Euler's equation for unidirectional flow-applications-Bernoulli's theorem -Torricelli's theorem.

UNIT V: RELATIVITY

Galilean-Newtonian relativity, Galilean transformations- Michelson Morley experiment and its importance-Einstein's postulates- Lorentz transformations and its interpretation-Consequences of Lorentz transformations-Length contraction, time dilation-relativistic addition of velocities-Mass-energy equivalence- Basic idea of general theory of relativity.

BOOKS FOR STUDY:

1. Mechanics- Part-I & II Narayanamoorthy, National Publishing Company.
2. Classical Mechanics-Gupta, Kumar and Sharma. Pragati Prakashan Publishing -Meerut (2010).
3. Statics, Hydrostatics and Hydrodynamics by M.Narayanamoorthy & N.Nagarathinam. National Publishing Company, Chennai (1989)

BOOKS FOR REFERENCE:

1. Mechanics-D.S.Mathur, S.Chand & Co, II edition, (2001).
2. Elementary Statistical Mechanics-Gupta Kumar (Chand publication)
3. Modern Physics by J.B.Rajam, S.Chand & Company Pvt.Ltd.

CC IV: THERMAL AND STATISTICAL PHYSICS

SEMESTER III

CREDIT : 5

INS. HRS. : 6

OBJECTIVE:

- To understand the concepts of thermal physics, statistical mechanics and thermodynamics.

UNIT I: THERMODYNAMICS

Zeroth law of thermodynamics – First law of thermodynamics - Work done in an isothermal and adiabatic processes-Heat engines - Reversible and irreversible processes - isobaric, isochoric process - Carnot's theorem -Second law of method thermodynamics - Thermodynamic scale of temperature - Maxwell's Thermo dynamical relations - derivations.

UNIT II: ENTROPY

Entropy - change in entropy in reversible and irreversible processes - temperature – entropy diagram – Classius - Clayperon equation – Enthalpy - Nernst heat theorem.

Thermal conductivity – Forbe's method Lee's disc method - Thermal conductivity of glass and rubber.

UNIT III: LOW TEMPERATURE

Joule - Thomson's effect - Porous plug experiment - Liquefaction of gases (air, H₂ and He) Adiabatic expansion process - Adiabatic demagnetization - Practical application of low temperature - Refrigerating mechanism -Electrolux refrigerator - Air conditioning machine.

UNIT IV: RADIATION

Blackbody radiation - Stefan's law - Boltzmann law - Blackbody-Rayleigh radiation - Rayleigh Jean's law -Wien's displacement law - Planck's law - Stefan's fourth power law – Pyrometry - Solar constant - Sources of solar energy.

UNIT V: STATISTICAL PHYSICS

Phase space – Maxwell - Boltzmann distribution law - Fermi Dirac distribution law - Application to electron gas – Bose - Einstein distribution law - Application to photon gas - Radiation Laws - Comparison of three Statistics.

BOOKS FOR STUDY:

1. Heat and Thermodynamics – Brijilal & Subramaniam S Chand; edition (2008)
2. Heat and Thermodynamics – J.B.Rajam & C.L.Arora, S. Chand, 9th Edition.
3. Statistical Mechanics - Satyaprakash & Agarwal, (KedarNath Ramnath and Co., Meerut, (2003).

BOOKS FOR REFERENCE:

1. Thermodynamics and Statistical Physics – Sharma & Sarkar. Himalaya Publishing House, (1988).
2. Thermal Physics by R.Murugesan, S.Chand & Company Pvt.Ltd.
3. Thermal Physics, Garg and others, Tata McGraw Hill, New Delhi. (1996)

CC V: MAJOR PRACTICAL II

SEMESTER IV

CREDIT : 4

Internal: 40 External: 60

INS. HRS. : 3

Any Twelve Experiments only

1. Static Torsion –Determination of n
2. Torsional pendulum –Determination of n and I
3. Stoke's method –Determination of viscosity of highly viscous liquid
4. Comparison of viscosity-Poiseuille's Flow method
5. Spherical calorimeter-Determination of Emissive power of a surface
6. Joule's calorimeter-Determination of specific heat capacity of liquid
7. Carey foster's Bridge-Determination of resistance and specific resistance.
8. Carey foster's Bridge-Determination of Temperature co-efficient of resistance
9. Potentiometer-Calibration of Ammeter
10. Potentiometer-Calibration of low range voltmeter
11. Potentiometer-Calibration high range voltmeter
12. Potentiometer-Determination of Temperature coefficient of resistance
13. A periodic Galvanometer-Figure of merit
14. Spectrometer-Determination of Refractive index of a liquid.
15. Spectrometer-Grating-Determination of ' λ ' Normal Incidence method

BOOKS FOR REFERENCE:

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Trichy.
2. C.C Ouseph, C.Rangarajan, R. Balakrishnan- A Text Book Of Practical Physics- S. Viswanathan Publisher-Part II (1996).
3. S.L Gupta And V.Kumar- Practical Physics- Pragati Prakashan- 25th Edition (2002).

ALLIED PHYSICS – I

SEMESTER III

CREDIT : 4

INS. HRS. : 5

OBJECTIVE:

- To impart an overview of different branches of physics to enable the students understand the basic concepts in mechanics, thermal physics, sound and optics.

UNIT I: PROPERTIES OF MATTER

Elasticity - Elastic constants relation - Bending of beams - Young's modulus by Non-uniform bending - Determination of rigidity modulus by torsional pendulum - Static torsion – Viscosity - Co-efficient of viscosity -Poiseuille's Formula - Comparison of viscosities - Burette method.

UNIT II: SOUND

Simple Harmonic Motion - Composition of two S.H.M along a straight line & at right angles - Lissajous figures - Demonstration of Lissajous figures - Uses. Ultrasonic - production of ultrasonic waves - Magnetostriction, Piezoelectric oscillator-Properties, Application of Ultrasonic waves- Acoustics of an auditorium- requisites of a good auditorium.

UNIT III: MECHANICS

Introduction to center of gravity-Center of gravity of a solid hemisphere-hollow hemisphere and solid cone. Floatation-Stability of floating bodies-Metacentre-Determination of metacentric height of a ship.

UNIT IV: THERMAL PHYSICS

Newton's law of cooling-Verification-Specific heat capacity of a liquid by cooling –Bomb calorimeter. Conduction-Co-efficient of thermal conductivity-Good and bad conductors-thermal conductivity of a bad conductor – Lee's disc method -Radiation-Black body-Stefan's law of radiation-Solar constant-Angstrom's Pyro heliometer-Surface temperature of the sun.

UNIT V: OPTICS AND SPECTROSCOPY

Electromagnetic spectrum-Types of spectra-Absorption & Emission spectra-Spectral response of human eye-Raman effect-Theory and experimental arrangement-Application of Raman Effect. Introduction to fiber optic communication - Optic fiber - Numerical Aperture.

BOOKS FOR STUDY:

1. Allied Physics – Sundaravelusamy.
2. Properties of Matter -R.Murugesan, S.Chand & Company Pvt.Ltd.
3. Applied Impact Mechanics- C. Lakshmana Rao, V. Narayanamurthy, K. R. Y. Simha, Wiley Publishers (2016).
4. Heat and thermodynamics – Brijilal & Subramaniyam, S.Chand & Company Pvt.Ltd.
5. Sound – Brijilal & Subramaniyam. Vikas Publishing.
6. Optics – Brijilal & Subramaniyam. S Chand; 23rd Rev. Edn. (2006).

BOOKS FOR REFERENCE:

7. Optical Fibres and Fibre Optic Communication Systems- Subir Kumar Sarkar. S Chand & Co Ltd (2007).
8. Allied Physics Paper I & II– R.Murugesan. S. Chand Publishing, (2005).
9. Ancillary Physics by Dr.Sabesan and others.
10. Ancillary Physics Vol.1 and Vol. 2 by Kamalakkannan and others.

ALLIED PHYSICS PRACTICAL-II

SEMESTER IV

CREDIT : 4

Internal: 40 External: 60

INS. HRS. : 3

Any Ten Experiments

1. Young's modulus-non-uniform bending-pin and microscope method
2. Surface tension-Drop weight method
3. Interfacial surface tension-Drop weight method
4. Viscosity-Graduated burette method
5. Sonometer-Verification of laws
6. Spectrometer-Refractive index of a solid prism
7. Spectrometer-Grating-Normal incidence method
8. Newton's Ring-Radius of curvature
9. Air wedge-Thickness of the material
10. Newton's Law of Cooling-Specific heat capacity of a given liquid
11. Lee's disc-Thermal conductivity of a bad conductor
12. EMF of a Thermocouple-Direct deflection method
13. Carey foster's Bridge-Specific resistance
14. Carey foster's Bridge-verification of laws of series and parallel
15. Meter Bridge-Specific resistance
16. Meter Bridge-Verification of laws of series and parallel
17. A periodic galvanometer-figure of merit
18. Junction diode characteristics
19. Zener diode characteristics
20. Logic gates using discrete components.
21. Spherical calorimeter – Determination of emissive power of a surface.
22. Potentiometer – calibration of low range voltmeter.
23. Static torsion – Determination of η .

BOOK FOR REFERENCE:

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Trichy.

APPLIED PHYSICS-I

SEMESTER III

CREDIT : 4

INS.HRS. : 5

OBJECTIVE:

- To summarize and give an overview of the field of Electricity and Magnetism.

UNIT I: ELECTROSTATICS

Gauss theorem and its applications-intensity due to charged sphere-capacitor-Principle of capacitor-Capacitors in series and parallel-Energy of a charged capacitor-Loss of energy due to the sharing of charges.

UNIT II: MAGNETOSTATICS

Magnetic field-Magnetic flux density-Magnetization-Permeability-Susceptibility-Relation between them-Magnetic potential-Properties of Dia, Para and Ferromagnetic Materials-Hysteresis-B-H Curve using Ballistic Galvanometer.

UNIT III: CURRENT ELECTRICITY

Laplace's law-Magnetic field intensity at a point due to a straight conductor carrying current-Circular coil-Solenoid-Force between two parallel conductors- Ohms law- Kirchhoff's law-Wheatstone's bridge-Carey Foster's bridge-Potentiometer-Measurement of current.

UNIT IV: ELECTROMAGNETIC INDUCTION

Introduction-Laws of electromagnetic induction-Eddy currents & determination of self-inductance-Anderson's method- Mutual induction-Determination –Coefficient of coupling - Transformer theory.

UNIT V: ALTERNATING CURRENT

AC circuits with double components-Measurements of current and voltage-Power in an AC circuit-Power factor derivation-Wattless current-Choke-Series and Parallel resonance circuits.-Oscillatory discharge of a condenser.

BOOKS FOR STUDY:

1. Electricity and Magnetism – Brijilal & Subramaniam, Ratan Prakashan Mandir, Agra, (1995).
2. Electricity and Magnetism- R.Murugesan, S.Chand & Company Pvt.Ltd.(2005)
3. Applied Physics –I- Sundaravelusamy.

BOOKS FOR REFERENCE:

1. Electricity and Magnetism- D.L.Seghal and Chopra, Sultan Chand and Sons, New Delhi.
2. Electricity and Magnetism – M.Narayanamurthi and N.Nagaratnam

APPLIED PHYSICS-II-PRACTICAL

SEMESTER IV

CREDIT : 4

Internal: 40 External: 60

INS. HRS. : 3

Any ten experiments

1. Semiconductor Diode-Characteristics
2. Zener diode-Characteristics
3. FET Characteristics
4. Transistor Characteristics in CE mode
5. Transistor Characteristics in CB mode
6. Bridge rectifier and Zener controlled Regulated power Supply
7. Field along the axis of a coil-M and H
8. Potentiometer-Measurement of resistance
9. Potentiometer-Measurement of current
10. Carey Foster's bridge-Specific resistance
11. Calibration of a thermistor and determination of its energy gap
12. Series resonance circuits
13. Single stage amplifier
14. FET Amplifier
15. Astable multivibrator
16. Mathematical operators-Addition, subtraction using Op-amp
17. Printed circuit board design.
18. LCR parallel resonance circuit
19. Logic gates (AND, OR, NOT ,NAND AND EX-OR) using Ics
20. NAND and NOR as universal gates.
21. Verification of Demorgan's theorem.
22. Half adder and Half subtractor using logic gates.

BOOK FOR REFERENCE:

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Trichy.

CC VI : OPTICS

SEMESTER IV

CREDIT : 5

INS. HRS. : 4

OBJECTIVE:

- To understand the fundamental laws concerning reflection, refraction, interference, diffraction, polarization, spectrum and allied phenomena.

UNIT I: ABERRATION IN LENSES

Spherical aberration - Aberration of a thin lens – Methods of Reducing spherical aberration – Chromatic aberration – Condition for achromatism of lenses – Coma – Astigmatism – Curvature of the field.

UNIT II: OPTICAL INSTRUMENTS

Ramsden's eyepiece – Huygen's eyepiece – Resolving power – Rayleigh's criterion of Resolution – Resolving power of a (1) Telescope (2) Microscope (3) Prism (4) Grating- Optical Fibre – Construction – Derivation of Numerical aperture – Optical fibre communication system with block diagram - Fibre optic Sensor

UNIT III: INTERFERENCE

Principle of superposition – Coherent sources – Colours of thin films – Air wedge – Newton's rings – Brewster's fringes – Michelson interferometer and its applications - measurement of wavelength and different between wavelengths of two close lines –Haidinger's fringes – Fabry Perrot interferometer.

UNIT IV: DIFFRACTION

Fresnel's diffraction – Diffraction at a circular aperture, opaque circular disc, Straight edge, Narrow wire – Fraunhofer diffraction at a single slit – Double slit – Grating with theory – Oblique incidence – Overlapping of Spectral lines.

UNIT V: POLARIZATION

Polarization by reflection – Refraction – Principal section – plane – Brewster's law – Malu's law – Nicol prism – Nicol prism as an analyzer and polarizer – Optical activity –Fresnel's explanation of optical activity.

BOOKS FOR STUDY:

1. Textbook of Optics, Brijal & N. Subramaniam, S.Chand & Company Pvt.Ltd.
2. Optics and Spectroscopy, R.Murugesan, S.Chand & company Pvt.Ltd.

BOOKS FOR REFERENCE:

1. . Optics- Ajay Ghatak. McGraw Hill Education; 5 edition (2012).
2. Optics and Atomic Physics-Singh & Agerwal, Pragati Prakashan, Meenit, 9th edition, (2002).

ALLIED PHYSICS-III

SEMESTER IV

CREDIT : 4

INS. HRS. : 4

OBJECTIVE:

- To impart an overview of different branches of physics to enable the students understand the basic concepts in Electricity and Magnetism, Electronics, Atomic physics and Nuclear physics.

UNIT I: ELECTRICITY AND MAGNETISM

Capacitor-Principle of a capacitor-Capacity of isolated spherical, cylindrical capacitor-Energy of charged capacitors-Sharing of charges and loss of energy. Magnetic field due to a current carrying conductor-Oersted Experiment-Maxwell's cork screw rule-Biot-Savart's law.

UNIT II: ATOMIC PHYSICS

Introduction to Atom model-Vector atom model-Spatial quantization, spinning of electron-quantum numbers-Pauli's exclusion principle - Stern Gerlach Experiment; X-ray-production of X-rays-Continuous and characteristic X-ray-Mosley's law and its importance-Bragg's law-Miller indices

UNIT III: NUCLEAR PHYSICS

Nuclear model-Liquid drop model-Nuclear energy-Mass defect-Binding energy-Radioactivity-Nature of Alpha, Beta and Gamma rays-Exponential law-Half life period-Mean life period. Fission and Fusion-Atom Bomb-Hydrogen bomb –Nuclear reactor-Thermonuclear reactions-Source of solar energy.

UNIT IV: BASIC ELECTRONICS

Semiconductors-Types Junction diode-Biasing-Characteristics-Zener diode Characteristics - Voltage regulator. Junction transistors-Working-Circuit configuration-CB and CE mode Characteristics-Transistor Biasing-Voltage divider method –CE transistor-Amplifier (single stage).

UNIT V: DIGITAL ELECTRONICS

Number system-Decimal, Binary, Octal, Hexadecimal and inter conversion-AND, OR, NOT gates-Construction using diodes and transistors. NAND and NOR gates-Universal building blocks –Boolean algebra-Demorgan's theorem-Verification.

BOOKS FOR STUDY:

1. Electricity and Magnetism Brijlal and Subramaniam, S.Chand & Company Pvt.Ltd.
2. Principle of Electronics V.K. Mehta . S Chand; 7th Revised edition (2005).
3. Allied Physics Paper I & II-R. Murugesan. S Chand (2006).
4. Allied Physics-II Sundaravelusamy. Priya Publications Karur (2012).
5. Ancillary Physics Vol.1 and Vol. 2 by Kamalakkannan and others.

BOOKS FOR REFERENCE:

1. Nuclear Physics, D.C. Tayal. Himalaya Publishing House (2011).
2. Digital Principle and Application Malvino and Leach. McGraw-Hill, 5th edition (1994).

APPLIED PHYSICS-III

SEMESTER IV

CREDIT : 4

INS. HRS. : 6

OBJECTIVE:

- To summarize and give an overview of the field of Digital Electronics

UNIT I: NUMBER SYSTEMS, CODES

Number systems- conversions – Binary addition, subtraction- multiplication- division- 8421 code – BCD code- Excess 3 code- Gray code- Binary to Gray and Gray to Binary conversion- ASCII code.

UNIT II: TRANSISTORS

PNP and NPN Transistors-DC characteristics of CE and CB configuration-Hybrid parameters-Only equation-Functions of transistors as an amplifier and oscillator-FET-Construction and Working-Characteristics of FET amplifier.

UNIT III: OPERATIONAL AMPLIFIERS

Basics of Op-amp-Inverting and Non-inverting Op-amp-Differential Op-amp-CMRR-Basic uses of Op-amp as sign and scale changer, phase shifter-Integrator-Differentiator-Adder-A/D conversion-Counter methods –Op-amp as a comparator.

UNIT IV: DIGITAL LOGIC CIRCUITS

Logic gates (AND, OR, NOT, XOR ONLY)-Boolean algebra-Demorgan's Theorem-Karnaugh map simplification-two variable-Standard Operating Procedure -Encoder-Decoder-Half Adder and Half Subtractor –RS Flip flop.

UNIT V: DIGITAL COMPONENTS

Integrated circuits-Fabrication of diode and transistor-Decoders (Basic circuit 2 into 1) –Multiplexers (Basic circuit 1 into 4)-Shift right and shift left registers.

BOOKS FOR STUDY:

1. The Fundamentals of Solid State Physics, Theraja, S. Chand and Co.
2. Digital Logic and Computer Design, Morris Mano, Pearson Education; 1 (2004)

BOOKS FOR REFERENCE:

1. Digital Principles and Applications, Malvino & Leach, McGraw-Hill, 5th edition (1994).
2. Electronic Devices and Circuits- Jacob Millman, Christos C. Halkias, McGraw Hill Education (1967).

CC VII : ELECTRICITY AND MAGNETISM

SEMESTER V

CREDIT : 5

INS. HRS. : 5

OBJECTIVE:

- To introduce the basic concepts of Electricity and Magnetism.

UNIT I : ELECTROSTATICS

Gauss theorem and applications-Electric field due to a uniformly charged Sphere-Electric field due to charged spherical and Cylinder-Capacitor-Parallel plate capacitor-Cylindrical Capacitor- Spherical Capacitor- Energy Stored in a Capacitor – Loss of Energy Stored in a Capacitor – Loss of Energy on sharing of Charges.

UNIT II : MAGNETIC PROPERTIES OF MATERIALS

Basic definitions – Electron theory of magnetism – Dia, Para, Ferro magnetic materials –Hysteresis – B-H curve using Ballistic Galvanometer – Energy loss due hysteresis and its importance.

UNIT III : CURRENT ELECTRICITY

Meter bridge – Construction & Working – Potentiometer – Calibration of ammeter-Calibration of low range voltmeter- \parallel - Carey Foster's bridge – Theory – Determination Of Specific resistance of the material of the unknown coil – Thermoelectricity – Peltier and Thomson coefficients – Application of thermodynamics to a thermocouple – Thermoelectric diagram – Determination of Peltier and Thomson coefficients.

UNIT IV : ELECTROMAGNETIC INDUCTION

Laws of electromagnetic induction – Self-induction – Rayleigh's methods – Mutual Induction – experimental determination of mutual induction – AC and DC circuits – Growth and decay of current in an LR circuit – Growth and decay of charge in a CR Circuit – Series and Parallel Resonance circuits applied with AC – Sharpness of Resonance – Power factor.

UNIT V : MAGNETIC EFFECTS OF CURRENT

Biot- Savart's law – Force due to charged conductor - Force between two parallel Conductors – Magnetic intensity due to straight conductor , circular coil and solenoid – Theory of ballistic galvanometers – Damping correction – Conversion of galvanometer into voltmeters and ammeter – ohm meters and multimeter.

BOOKS FOR STUDY:

1. Electricity and Magnetism, Brijlal and Subramaniam, RatanPrakashan Mandir, Agra, (1995).
2. Electricity and Magnetism, R.Murugesan, S.Chand & Company Pvt.Ltd.

BOOKS FOR REFERENCE:

1. Electricity and Magnetism, K.K . Tewari, S. Chand and Company, New Delhi, (2002).
2. Electricity and Magnetism, Sehgal, Chopra and Sehgal, Sultan Chand and Sons, New Delhi.(1996)

CC VIII : ATOMIC PHYSICS

SEMESTER V

CREDIT : 5

INS. HRS. : 5

OBJECTIVE:

- To introduce the basic structure of an atom and its applications in the field of spectroscopy.

UNIT I: POSITIVE RAY ANALYSIS

Properties of positive rays-e/m of positive rays – Thomson’s parabola method – Aston’s method – Bainbridge’s method-Dempster’s mass spectrograph-Determination of masses-Isotopes.

UNIT II: PHOTO ELECTRICITY

Photoelectric emission – Laws –Lenard’s experiment – Richardson & Compton experiment – Einstein’s photoelectric equation –Experimental verification of Einstein’s photoelectric equation by Millikan’s experiment – Photoelectric cells – photo emissive photoconductive, photovoltaic cells – Application.

UNIT III : VECTOR ATOM MODEL

Salient features of Vector atom model-Variou quantum numbers-L-S and j-j couplings-Pauli’s exclusion principle – Electronic configuration of elements and periodic classification – Magnetic dipole moment of electron due to orbital and spin motion – Bohr magneton –Stern Gerlach experiment.

UNIT IV : ATOMIC SEPCTRA

Spectral terms and notations – Selection rules – Intensity rule and interval rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in alkali spectra – Zeeman Effect – Larmor’s theorem – Debye’s quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – Theoretical explanation – Lande g factor and Paschen Back effect and stark effect.

UNIT V : X-RAYS

X-rays – Bragg’s law – Bragg’s X-ray Spectrometer – Origin and analysis of continuous X-rays spectrum – Characteristics X-ray spectrum – Mosley’s law and its importance – Compton effect – Derivation of expression for change in wavelength – its experimental verification.

BOOKS FOR STUDY:

1. Modern physics R.Murugeshan, S.Chand & Company Pvt.Ltd.(2003).
2. Atomic and Nuclear Physics Brijlal and Subramanyam. S.Chand & Company Pvt.Ltd.(2006)
3. Modern Physics for Degree Students, J.B.Rajam, 3rd Ed., S. Chand and Co., New Delhi, (1967).

BOOK FOR REFERENCE:

1. Concepts of modern Physics by A.Beiser, Tata Mac.Graw Hill edition.(2009)

CC IX: BASIC ELECTRONICS

SEMESTER V

CREDIT : 5

INS. HRS. : 5

OBJECTIVE:

- To summarize an overview of the evolution of electronics.

UNIT I: SEMICONDUCTORS AND TRANSISTORS

Biasing of p-n Junction-Characteristics of a Zener diode-Voltage Regulator. Junction Transistors in Common Base and Common Emitter mode-Load line-Operating point-Transistor biasing-Voltage divider method-Hybrid Parameters-Two Port network-Determinations of h-Parameters.

UNIT II: AMPLIFIERS

Transistor as non amplifiers-Load line analysis-Analysis of CE amplifier using hybrid parameters-Power amplifier classification-Class A Power amplifier, Transformers coupled-Class B Push pull amplifier-RC Coupled amplifier-Frequency response-Emitter follower-feedback-Negative feedback amplifiers.

UNIT III: OSCILLATOR AND SWITCHING CIRCUITS

Barkhausen criterion for oscillations-Transistor as an oscillator-Working of Tuned collector, Hartley and colpitt's oscillators-Calculation of frequency of oscillation-Multivibrators-Astable, Monostable and Bistable.

UNIT IV: OPERATIONAL AMPLIFIERS

Characteristics-Inverting amplifier-Non-inverting amplifier ,n-Adders-Subtractor –Differentiator-Integrator-Op-amp as low, high and band pass filters- Solving differential equations –first and second orders only

UNIT V: SPECIAL SEMICONDUCTOR DEVICES

FET-Working-Difference between FET and Transistor-Advantages of FET-Characteristics of FET-MOSFET-Working-SCR-Working-Characteristics-SCR as switch-UJT-Working-Characteristics-Application as relaxation oscillator.

BOOKS FOR STUDY:

1. Modern Physics R. Murugesan, S.Chand & Company Pvt.Ltd.
2. Principle of Electronics V.K. Mehta, S.Chand & Company Pvt.Ltd.
3. Electronics(Mannual) Sundaravelusamy.
4. Solid State Electronics B.L. Theraja, S. Chand Limited, 2006
5. Foundation of Electronics by Chattopadhyaya, South Asia books publisher.

BOOKS FOR REFERENCE:

1. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan Publication-Meerut (2012)
2. A Textbook of Applied Electronics R.S. Sedha, S Chand; 3rd Revised edition.

CC X : MAJOR PRACTICAL-III

SEMESTER V

CREDIT : 4

Internal: 40 External: 60

INS. HRS. : 6

Any Twelve Experiments

1. Spectrometer-i-d curve
2. Spectrometer-i-i' curve
3. Spectrometer-Dispersive power of a prism-Mercury Spectrum
4. Spectrometer – Small angled prism
5. Spectrometer – Grating-Normal incidence method-Dispersive power
6. Spectrometer – Grating- minimum deviation method –Dispersive power
7. Spectrometer – Cauchy's constants
8. Spectrometer – Hartmann's constants
9. Field along the axis of a coil – Determination of magnetic moment
10. M and H – Absolute determination using deflection and vibration magnetometer.
11. Potentiometer – Specific resistance
12. Potentiometer – EMF of a thermocouple
13. Potentiometer – Resistance of thermistor
14. Potentiometer – Comparison of EMF's
15. Thermistor – Energy gap
16. Spot galvanometer – Figure of merit
17. Spot galvanometer – Comparison of EMF's.
18. Newton's rings-Determination of Refractive index of a liquid
19. Koenig's method-Determination of Young's modulus of a given material

BOOKS FOR REFERENCE:

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Tricity.
2. C.C Ouseph, C.Rangarajan, R. Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II (1996)
3. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan- 25th Edition (2002).

MAJOR BASED ELECTIVE I: SPECTROSCOPY AND LASER PHYSICS

SEMESTER V

CREDIT : 3

INS. HRS. : 4

OBJECTIVES:

- To understand the basic concepts of microwave, IR and Raman spectroscopy and the associated measurement techniques.
- To introduce the physical and engineering principles of laser operation and their applications.

UNIT I: SPECTROSCOPY

Definition of spectrum- Electromagnetic radiation- interaction of electromagnetic radiation with molecules – Type of spectra – Emission spectra- Absorption spectra-Fraunhofer line-Molecular spectroscopy-Quantization of different forms of energies in molecules.

UNIT II: MICROWAVE SPECTROSCOPY

Rotation of molecule and its spectra-Rigid rotator and its spectrum-Linear, Symmetric top molecules-Microwave Spectrometer.

UNIT III: INFRARED SPECTROSCOPY

Vibrating diatomic molecules as harmonic oscillator – anharmonic oscillator-Interaction of vibrational & rotational energy -Double beam Spectrometer-Application of vibrational spectroscopy.

UNIT IV: RAMAN SPECTROSCOPY

Theory of Raman effect-Pure rotational spectra-linear, symmetric top molecules-Pure vibrational spectra- Raman activity of vibration-Structural determination from Raman and IR spectroscopy-Raman Spectrometer.

UNIT V: LASER PHYSICS

Population inversion-pumping processes-Threshold condition-Quantum yield-Three level system-ruby laser –pumping power-four level laser-CO₂ laser-Nd –YAG laser-He-Ne laser- Application of Laser

BOOKS FOR STUDY:

1. Elements of Spectroscopy Gupta Kumar Sharma. Pragati Prakashan (2011).
2. Fundamental of Molecular Spectroscopy - C.N. Banwell. Tata McGraw Hill., New Delhi, (1993).

BOOKS FOR REFERENCE:

1. Laser theory & Applications- K.Thyagarajan, A.K.Ghatak, Mc Millan, India Ltd, (1984).
2. Molecular spectroscopy P.R. Singh-S.K. Dikshit. New Delhi : S. Chand, (1981)
3. William T. Silfast, Laser fundamentals, University press, published in south Asia by foundation books, New Delhi, (1998).

MAJOR BASED ELECTIVE I: SOLID STATE AND MATERIAL SCIENCE

SEMESTER V

CREDIT : 3

INS. HRS. : 4

OBJECTIVES:

- To understand basic concepts of phase transition materials and biomaterials.
- To gain the knowledge of NLO materials and polymers.

UNIT-I: PHASE TRANSITION MATERIALS AND BASIC CONCEPTS

Solubility limit -phases -microstructure –phase equilibria – unary phase diagrams-Binary phase diagrams – Binary isomorphous systems – Interpretation of phase diagrams-Development of microstructure in is amorphous alloys -mechanical properties of isomorphous alloys- Binary eutectic systems –Development of microstructure in eutectic alloys – Equilibrium diagrams having intermediate phases or components – Eutectoid and peritectic reactions -Concurrent phase transformations - ceramics and ternary phase diagrams -The Gibbs phase rule - The iron – iron carbide phase diagrams.

UNIT-II: CERAMICS AND POLYMERS CERAMICS:

Introduction -Glasses - Glass Ceramics – clay products – refractory's –abrasives cements – advanced ceramics - ceramic phase diagrams -brittle fracture of ceramics- stress - strain behavior – mechanism of plastic deformation –miscellaneous mechanical consideration. Polymers - Polymerization mechanism – Polymer structures - Deformation of polymers - Behaviour of polymers,

UNIT-III: BIOMATERIALS:

Introduction to biomaterials for biomedical applications, Chemical structure and property of biomaterials, Degradation of biomaterials, Polymeric biomaterials: Introduction, preparation, hydrogel biomaterials, Bio conjugation techniques, Biomaterials for drug delivery application (small molecules, gene and protein)-Biomaterials implantation-Biomaterials for imaging and diagnosis.

UNIT-IV: NLO MATERIALS

Introduction-Harmonic Generation-Second Harmonic Generation -Phase Matching-Third Harmonic Generation-Optical Mixing-Parametric Generation of Light- Self focusing of Light– nonlinear optical materials.

UNIT - V: ENERGY CONVERSION AND STORAGE MATERIALS

Solar cells: Organic solar cells – Polymer composites for solar cells - p-n junction - Device fabrication and characterization –Nanomaterials for solar cells - Dye-sensitized solar cells - Organic - inorganic hybrid solar cells. Batteries -primary and secondary batteries, Lithium, Solid-state and molten solvent batteries; Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries, Super capacitors for energy storage. Role of carbon nanomaterials as electrodes in batteries and super capacitors.

BOOKS FOR STUDY:

1. Dr. M.N. Avadhanulu, Material science, S.Chand & Company, New Delhi, 2014. Books for:
2. M.Arumugam, Material science, Anuradha publishers, 1990.

BOOKS FOR REFERENCE:

1. V. Raghavan, Material Science and Engineering , Printice Hall India.,2004.
2. V. Rajendran, Material Science, Tata McGraw Hill Ltd, New Delhi,2001.

CC IX : WAVE MECHANICS AND NUCLEAR PHYSICS

SEMESTER VI

CREDIT : 5

INS. HRS. : 6

OBJECTIVES:

- To introduce the basic concepts of quantum mechanics.
- To deal with the fundamental properties of nucleus and their models.

UNIT I: DUALITY

Dual nature-De Broglie waves-Wave packet, phase and group velocities-Davisson-Germer experiment-G.P. Thomson experiment – Gamma ray microscope-Uncertainty principle-Non-existence of electron inside the nucleus.

UNIT II: WAVE MECHANICS

Wave function for a free particle-Time independent and Time dependent Schrodinger equation-Physical significance of wave function-Operators-Eigen value and Eigen function-Postulates-Probability current density-Normalization of wave function-Expectation values-Applications of Schrodinger equation-Free particles-particle in one-dimensional box-One dimensional linear harmonic oscillator.

UNIT III: NUCLEAR PHYSICS

Basic properties of nuclei-Nuclear size, mass density, radius, charge and spin-Mass defect- Binding energy-Packing fraction-Magnetic moments of nucleus-Rutherford's scattering experiment-Radioactivity-Properties of α , β , γ - rays Soddy Fregen's Law- Radioactive equilibrium-Laws of successive disintegration –Half-Life –Mean Life Cyclotron-Betatron-Linear accelerator-Geiger Muller Counter.

UNIT IV: NUCLEAR MODELS

Liquid drop model-Application to fission-Shell model-Magic numbers-Spin-Orbit coupling-Nuclear reactions-Types-Q-value of nuclear reaction-Nuclear energy –Nuclear fission-Atom bomb-Nuclear fusion-Thermonuclear reactions-Hydrogen bomb-Basic ideas of cold fusion.

UNIT V: ELEMENTARY PARTICLES

Classification of elementary particles-Particles and antiparticles-Leptons-Mesons-Baryons-Strange particles-Hyperons-Conservation laws-Fundamental interactions-Basic ideas of Quarks.

BOOKS FOR STUDY:

1. Modern Physics - R. Murugesan, S.Chand & Co.
2. Nuclear Physics (Anukkaru iyarpiyal)- Sundaravelusamy.
3. Atomic and Nuclear Physics - Brijlal and Subramanyam, S.Chand & Co.
4. Nuclear Physics-D.C.Tayal, Himalaya Publisher house, 2nd edition, 201.

BOOKS FOR REFERENCE:

1. Concepts of Modern Physics, Arthur Beiser, McGraw Hill Education; 6 edition (17 July 2009)
2. Fundamentals of Modern Physics, Duggal and Chopra, 8th edition, Shobnlal Nagin Chand and Co., 1997.
3. Modern Physics J.B. Rajam, S. Chand; 3rd edition (1967)
4. Quantum mechanics, Bagde & Singh. S. Chand & Company Ltd. (2004)
5. S.B.Patel, Nuclear Physics, Wiley Eastern Publications, 1st edition, 1992.

CC XII: SOLID STATE PHYSICS

SEMESTER VI

CREDIT : 5

INS. HRS. : 6

OBJECTIVES:

- To expose the students to the basics of Solid State Physics.
- To introduce the applications of Solid State Physics and various physical properties of solids.

UNIT I: CRYSTAL STRUCTURE

Introduction – Periodic array of atoms – Crystal lattice – Unit cell – Basis – Symmetry considerations – Classification of crystals – Bravais lattices in three dimensions – Crystal Planes and Miller indices – Single crystal Structure.

UNIT II: CRYSTAL DIFFRACTION

Bragg's law – Laue equations – Experimental X-ray diffraction methods – Laue method – Rotating crystal method – Powder method – Neutron diffraction.

UNIT III: THERMAL PROPERTIES

Heat capacity – Classical theory – Einstein model – Debye model – Density of modes (3d) – Debye model – Anharmonicity and thermal expansion of crystals – Principal coefficients – Gruneisen relation – Thermal conductivity.

UNIT IV: FREE ELECTRON THEORY OF METALS

Introduction – Free electron model – Free electron gas in 3-dimensions – Density of states – Thermal capacity of free electron system – Paramagnetism of free electrons – Sommerfeld theory of electrical conductivity – Thermal conductivity – Wiedemann Franz law – Hall effect – Failure of free electron theory.

UNIT V: SUPERCONDUCTORS

Effect of magnetic field – Meissner effect – Persistent current – Type of superconductors – Intermediate state – Entropy – Specific heat capacity – Thermal Conductivity – Penetration Depth – London equation's – AC and DC Josephson's effect – BCS theory (qualitative only).

BOOKS FOR STUDY:

1. R. Asokamani, Solid state physics, principles and applications, I edition (2006), Anamaya publishers
2. Solid State Physics Kakani, Hemarajani, Sultan Chand & Co.,
3. Solid State Physics, S. O . Pillai.
4. Solid State Physics, Gupta, Kumar and Sharma.

BOOKS FOR REFERENCE:

1. Solid State Physics, Dekker A.N. MacMillan
2. Solid State Physics Hall H. E, E.L.B.S Manchester Physics series
3. An Introduction to Solid State Physics (5th edition), Kittel. C

CC XIII : MAJOR PRACTICAL –IV

SEMESTER VI

CREDIT : 4

Internal: 40 External:60

INS. HRS. : 6

SECTION – A (Electronics)

(Any 8 Experiments)

1. Series and Parallel resonant circuits.
2. Junction diode and Zener diode- Characteristics
3. Transistor characteristics in CE mode
4. Zener regulated Powers Supply – Percentage of regulation
5. Semiconductor diodes – Voltage Doubler and Tripler
6. Single Stage RC coupled amplifier – Transistor
7. Hartley oscillator –Transistor
8. Colpitt's oscillator –Transistor
9. Astable multivibrator – Transistor
10. Monostable multivibrator – Transistor
11. FET Characteristics
12. Logic gates – AND, OR and NOT Gates using discrete components – Verification of truth table
13. NAND, NOR gates using discrete components – Verification of truth table
14. Verification of De Morgan's theorem
15. Universal gates NAND/NOR and Basic gates from Universal Gates (ICs) – Verification of truth table
16. Half adder and Half subtractor

SECTION – B (Using 8085 Microprocessor)

(Any 2 Experiments)

17. 8-bit addition and 8-bit subtraction
18. 8-bit multiplication and 8-bit division
19. Conversion from Decimal to Hexadecimal system
20. Conversion from Hexadecimal to Decimal system
21. 16-bit addition. Solving Quadratic Equations

SECTION – C (C PROGRAMMING)

(Any 2 Experiments)

22. Roots of Algebraic Equations –Newton Raphson method.
23. Finding the smallest/largest element in an array
24. Sorting a set of numbers in ascending/descending order.
25. Addition/Subtraction/Multiplication of two matrices

BOOKS FOR REFERENCE:

1. B.Sc. Physics Practical Manual, Dept. of Physics, SJC (A), Tricity.
2. C.C Ouseph, C.Rangarajan, R. Balakrishnan- A Text book of Practical Physics- S.Viswanathan Publisher-Part II (1996).
3. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan- 25th Edition(2002)

MAJOR BASED ELECTIVE II: INTEGRATED ELECTRONICS

SEMESTER VI

CREDIT : 3

INS. HRS. : 4

OBJECTIVES:

- To introduce the concept of number systems and to give a description of logic gates and Boolean algebra.
- To give a detailed description of combinational and sequential logic systems and their application to microprocessor.

UNIT I: BINARY LOGIC

Decimal, Binary, Octal, Hexadecimal number system and interconversion- Binary addition and subtraction—BCD code-Excess 3 code-Gray code- Laws of Boolean algebra-Demorgan's theorems- Logic gates-Universal gates- Minterms and maxterms –Karnugh map (upto four variables)-SOP only .

UNIT II: INTEGRATED CIRCUITS

Fabrication of basic monolithic integrated circuits using different steps – Integrated diode, transistor, registers and capacitors – Advantages and limitations of integrated circuits – SSI, MSI LSI – Basic ideas.

UNIT III: COMBINATIONAL AND SEQUENTIAL LOGIC

Half and full adder – Half and subtractor – BCD to 7 segment Decoder – Decimal to BCD encoder – 4:1 Multiplexer – 1:4 Demultiplexer – RS flip Flop – Clocked RS flip flop – JK flip flop – Shift registers.

UNIT IV: SEMICONDUCTOR MEMORIES

Basics – ROM – PROM – EPROM –RAM – DRAMS – Memory addressing memory cells – CAM – CCD.

UNIT V: MICROPROCESSOR

Architecture of 8085 - Buses – Pin configuration – Microprocessor Programming – Machine language – Assembly language – Addressing modes – Instruction format – Types of instruction – Programming for 8-bit addition, 8-bit subtraction, Largest number in an array of 8bit unsigned numbers and Smallest number in an array of 8-bit unsigned numbers

BOOKS FOR STUDY:

1. Digital Principles and Applications – Malvino & Leach, Tata McGraw Hill, New Delhi, (1991).
2. Modern Digital Electronics - R.P.Jain McGraw Hill Education; 4 edition (2009)
3. Integrated Electronics – Milmann & Hakiyas, McGraw Hill Education; 2 edition (2017)
4. Introduction to integrated electronics, Digital & Analog Electronics - V. Vijayendran, S.Viswnathan (Printers & Publishers) PVT., LTD. (2008).
5. Microprocessor architecture programming and application with 8085/8080- A Gaonkar, Penram International Publishing; 6th edition (2013)

BOOKS FOR REFERENCE:

1. Digital Electronics, W.H.Gothmann, Prentice Hall of India, Pvt. Ltd., New Delhi (1996).
2. Digital Electronics and Microcomputers, R.K.Gaur, Dhanpat Rai (Publishers), (1993).
3. Digital logic and Computer Design, Morris and Mano, Prentice Hall, New Delhi, (1999).

MAJOR BASED ELECTIVE II: ELECTRICAL AND ELECTRONICS INSTRUMENTATION

SEMESTER VI

CREDIT : 3

INS. HRS. : 4

OBJECTIVES:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in domestic wiring
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To introduce the functional elements and working of sensors and transducers

UNIT I ELECTRICAL CIRCUITS

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems.

UNIT II MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS

Magnetic circuits-definitions-MMF-flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems. Domestic wiring, types of wires and cables, earthing protective devices- switch fuse unit-Miniature circuit breaker- m e circuit breaker, safety precautions and First Aid

UNIT III ELECTRICAL MACHINES

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT IV ANALOG ELECTRONICS

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters, harmonics.

UNIT V SENSORS AND TRANSDUCERS

Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

BOOKS FOR STUDY:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.
3. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019

BOOKS FOR REFERENCE:

1. John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
2. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.

MAJOR BASED ELECTIVE III

COMPUTER PROGRAMMING – ‘C’ LANGUAGE

SEMESTER VI

CREDIT : 4

INS. HRS. : 5

OBJECTIVES:

- To introduce the basic concepts of C programming.
- To enable the students to write C programmes on their own.

UNIT I: DATA TYPES, OPERATORS AND EXPRESSIONS

History of C – Importance of C – Basic structure of C Programs – Programming style – Executing a ‘C’ program – Character set – Keywords and identifiers – Constants – Variables – Data types – Declaration of variables – Assigning values to variables. Operators – Classification – Arithmetic expression and its evaluation – Precedence and Associativity of operators.

UNIT II : I/O , CONTROL STATEMENTS AND ARRAYS

Library functions- gets, puts, getchar, putchar functions – Formatted input (scanf) and Formatted output (printf)-Decision making with if-simple if-if ...else-nested if ...else .The Else if ladder-switch-goto-break-continue-while-dowhile-for statements.

Arrays-One dimensional arrays – Declaration of one dimensional arrays- Initialization of one dimensional arrays – Two dimensional arrays – Declaration of two dimensional arrays- Initialization of Two dimensional arrays- Multidimensional arrays – Character strings – Initialization-String handling function.

UNIT III: FUNCTION AND STRUCTURE

Function-Function definition-Return statement-Function call-Function declaration-Types of functions-Local and Global variables-Recursion-Storage class- Character Strings-Initialization-String Handling function. Structures-Declaring structure variables-Accessing structure member – structure initialization.

UNIT IV: POINTERS, FILES AND PREPROCESSORS

Pointers- The address operator (&- The indirection operator(*)-Initialization of pointer variables-Pointer arithmetic- Pointers and functions-Pointers as function arguments-Pointers and arrays – Pointer to pointers.

Files in C-File declaration – Opening and closing a file- Accessing a file – Character, Integer and String oriented I/O functions- Formatted and Unformatted I/O functions-Error handling during I/O operations- Random access files – Functions used with Random Files.

UNIT V: PROGRAMS

Development of algorithm, flowchart and program for the following problems:

- Solving Quadratic Equations
- Roots of Algebraic Equations –Newton Raphson method.
- Finding the smallest/largest element in an array
- Sorting a set of numbers in ascending/descending order.
- Addition/Subtraction/Multiplication of two matrices

BOOKS FOR STUDY:

1. Programming in ANSI C - E. Balagurusamy. Tata McGraw Hill, New Delhi,(1999). (2003).
2. Schaum’s outline series theory and problems of programming with C- Byron S.Gottrified. McGraw Hill Internationals, (1996).
3. Programming with C - Venugopal K.P & Sudep R.P., Tata McGraw Hill, New Delhi,(1998).
4. Programming in C – Siymala Krishanan.

BOOK FOR REFERENCE:

1. Pointers in C - Yashavant P. Kanetkar, BPB Publications

**MAJOR BASED ELECTIVE III
MICROPROCESSOR AND MICROCONTROLLER**

SEMESTER VI

CREDIT: 4

INS. HR: 5

OBJECTIVES:

- To enhance the knowledge about the architecture of microprocessors and interfacing devices.
- To understand the instruction sets in microprocessor and microcontroller.

UNIT I: THE 8086 MICROPROCESSOR

Introduction to 8086 — Microprocessor architecture — Addressing modes — Instruction set and assembler directives — Assembly language programming — Modular Programming — Linking and Relocation — Stacks — Procedures — Macros — Interrupts and interrupt service routines — Byte and String Manipulation.

UNIT II: 8086 SYSTEM BUS STRUCTURE

8086 signals — Basic configurations — System bus timing — System design using 8086 — I/O programming — Introduction to Multiprogramming — System Bus Structure — Multiprocessor configurations — Coprocessor, Closely coupled and loosely Coupled configurations — Introduction to advanced processors.

UNIT III: I/O INTERFACING

Memory Interfacing and I/O interfacing — Parallel communication interface — Serial communication interface — D/A and A/D Interface — Timer — Keyboard /display controller — Interrupt controller — DMA controller — Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV: MICROCONTROLLER

Architecture of 8051 — Special Function Registers(SFRs) — I/O Pins Ports and Circuits — Instruction set — Addressing modes — Assembly language programming.

UNIT V: INTERFACING MICROCONTROLLER

Programming 8051 Timers — Serial Port Programming — Interrupts Programming — LCD & Keyboard Interfacing — ADC, DAC & Sensor Interfacing — External Memory Interface- Stepper Motor and Waveform generation — Comparison of Microprocessor, Microcontroller, PIC and ARM processors

BOOKS FOR STUDY:

1. The 8051 Micro Controller Architecture, Programming and Applications-Kenneth J. Ayala –3rd Edition, Penram International.
2. Microprocessor architecture, programming and Application- R.Goankar, (Wiley Eastern, New Delhi, 1985)

BOOK FOR REFERENCE:

1. Fundamentals of Microprocessors and Microcomputers-B. Ram, Dhanpat Rai Publications, New Delhi

**.SKILL BASED – I
ELECTRICAL APPLIANCES**

SEMESTER IV

CREDIT : 2

INS. HRS. : 2

OBJECTIVE:

- To introduce basic ideas behind electrical appliances and its applications for domestic usage

UNIT I: FUNDAMENTALS OF ELECTRICITY

Electricity – Charge - Electric current – AC – DC - Advantages of AC over DC - Advantages of DC over AC – Phase – Single Phase - Poly phase – Advantage of poly phase over single phase – Electrical shocks and its effect.

UNIT II: MEASURING INSTRUMENTS

Galvanometer-Ammeter-Voltmeter – Ohm meter – AVO meter – (Multi meter) – Watt hour meter – commercial electrical billing (Problem) – Line tester.

UNIT III: LIGHTING AND HEATING APPLIANCES

Design and working of Fluorescent lamp - CFL-LED- Electric hot plate.

UNIT IV: COOLING APPLIANCES

Design and working of Fan – Refrigerators – Air conditioning –Air cooler.

UNIT V: MODERN ELECTRICAL APPLIANCES

Design and working of 1. Water motors 2. Microwave oven 3. Vacuum cleaner 4. UPS 5. Inverter.

BOOK FOR STUDY:

1. Basic electrical engineering by M.L.Anwani, Dhanpat Rai and Co. New Delhi.
2. Textbook of Electrical Technology ,B.L.Theraja, Vol.1&2.

BOOK FOR REFERENCE:

1. Consumer Electronics – S.P.Bali.

NON MAJOR ELECTIVE – I - PHYSICS MADE EASY

SEMESTER IV

CREDIT : 2

INS. HRS. : 2

OBJECTIVE:

- To impart the students a simple understanding of the basic concepts of physics.

UNIT I - MECHANICS

Force – Weight – Work – Energy – Power – Horsepower – Centrifuge – Washing Machine,

UNIT II - CONVENTIONAL ENERGY SOURCES

Conventional energy sources: Fossil fuels – Water power – Nuclear power – Hazards of nuclear energy – Non-conventional energy sources:

UNIT III - NON-CONVENTIONAL ENERGY SOURCES

Solar energy – applications solar energy – wind energy – Ocean energy – Geothermal energy – Wind energy – Ocean thermal energy conversion – energy from waves and tides (Basic ideas)

UNIT IV- SOUND OPTICS

Sound waves – Doppler effect – Power of lens – long sight and short sight – Microscope – Telescope – Binocular - Camera

UNIT V - COSMOS

Visible universe – Galaxies – Milky way – Solar system – Birth and death of stars – Neutron star, Pulsars, Black holes – Big Bang theory

BOOKS FOR STUDY:

1. Almost Everyone's guide to science, John Gribin – University Press (1998)
2. Inside Science, Edited by John Allen – BBC Books, (1988)
3. Physical Science Fundamentals, John J Merrill, W Kenneth Hamblin, James M Thorne – Macmillan.
4. The Learner's Series – Everyday Science – Published by INFINITY BOOKS, New Delhi

BOOK FOR REFERENCE:

1. "Renewable Energy sources and their environmental impact" – S. A. Abbasi and NasemaAbbasi PHI Learning Pvt. Ltd., New Delhi (2008).

NON MAJOR ELECTIVE – II - SIMPLE APPLIANCES

SEMESTER IV

CREDIT : 2

INS. HRS. : 2

OBJECTIVE:

- To impart the students a simple understanding of the basic concepts of Simple Appliances and its applications.

UNIT I: SAFETY PRECAUTION

Electricity – Basic principles – Practical unit of electricity – International system (S.I) of units – Electric shock- Precautions to avoid electric shock – Rescue steps in electric shock – methods of resuscitation – Electric Line Circuit breaker (ELCB).

UNIT II: WIRING

Wiring system – electric supply to house and factories – Types of wiring – ISI Rules – Megger testing – Earthing.

UNIT III: ELECTRICAL MEASURING INSTRUMENTS

Moving coil instruments – Voltmeter – Ammeter – Wattmeter – Kilowatt meter – Frequency meter – Multimeter.

UNIT IV: ELECTRICAL APPLIANCES

Electricity in house – design for heating element – electric iron –induction stove

Cooling appliances - principle, construction and working of refrigerator – air conditioner

Other important electrical appliances; principle, construction and working of fluorescent lamp – LED lamp –washing machine.

UNIT V: ELECTROMAGNETIC APPLICATION

Basics of Electromagnetic theory – Solenoid – Electric motor (AC & DC) – Electric generator – transformer – Backup power suppliers (UPS, Invertors)

BOOKS FOR STUDY:

1. Basic Electrical Engineering, A. L. Anwani and I. Anwani. 2003, DhanpatRai and Co (P) Ltd. Delhi.
2. Textbook of Electrical Technology, B. L .Theraja, Vol. 1 & 2.
3. Electrical Instruments and Measurement Techniques – William D. Cooper – PHI Pvt Co., New Delhi, 1997.

BOOK FOR REFERENCE:

1. Consumer Electronics – S.P. Bali.

SKILL BASED – II - MEDICAL PHYSICS

SEMESTER V

CREDIT : 2

INS. HRS. : 2

OBJECTIVE:

- To present an overview of how the instruments are employed for medical diagnostics.

UNIT – I: MECHANICS OF HUMAN BODY

Static, Dynamic and Frictional forces in the body - Heat and temperature – Temperature scales – clinical thermometer – Thermography – Heat Therapy – Cryogenics in medicine – Heat losses from body – Pressure in the body – Pressure in skull, Eye and Urinary Bladder.

UNIT – II: DIAGNOSTIC DEVICES

X-ray machine – Comparison between Radiography and Fluoroscopy – Angiography (Basic concept) – Thermography – Comparison between normal and cancer cells.

UNIT – III: THERAPEUTIC DEVICES

External and internal defibrillators – ac defibrillator – DC defibrillator – Pace maker – Comparison between External and internal pace makers.

UNIT – IV: LASER IN MEDICINE

Laser – Principle – Properties – General applications – Laser based blood cell counting – Laser surgery – Advantages.

UNIT – V: ULTRASONICS IN MEDICINE

Ultrasonics – Properties – Ultrasonic propagation through tissues – Ultrasonic diathermy – B mode Ultrascan – applications of diagnostic ultrasound.

BOOKS FOR STUDY

1. John R. Cameron, Medical Physics, University of Wisconsin, Madison & James G. Skofronick, Florida State university, Tallahassee, A wiley-interscience Publication, John Wiley & sons, Singapore, 2005.
2. Dr. M. Arumugam, Biomedical Instrumentation, Second Edition, Anuradha Publicaions PVT, Kumbakonam, 10th Reprint 2010.

BOOK FOR REFERENCE:

1. Leslie Cromwell, Fred J. Weibell, Enrich A. Pfeiffer, Biomedical Instrumentation and Measurements, Prentice Hall of India, PVT, New Delhi, Second Edition, 2005.

SKILL BASED – III - AUDIO AND VIDEO SYSTEMS

SEMESTER V

CREDIT : 2

INS. HRS. : 2

OBJECTIVE:

- To introduce the basic concepts of Audio and Video Systems.

UNIT I: MICROPHONES

Characteristics of Microphones – Moving coil Microphone – Crystal Microphone – Carbon Microphone – Special Microphones.

UNIT II: LOUDSPEAKERS

Characteristics of Loudspeakers – Moving coil cone LS – Electrodynamic LS – Horn type LS – Multi-way Speaker System (Woofers and Tweeters)

UNIT III: TELEVISION

Introduction – TV Transmitter – TV Receiver – MAC Encoder – MAC Receiver – Digital TV system.

UNIT IV: TV CAMERA

Vidicon camera tube – Plumbicon camera tube – Colour cameras – Video Monitors – CCTV.

UNIT V: TROUBLESHOOTING IN AUDIO AND VIDEO EQUIPEMENT

General Troubleshooting Procedure – Testing of Power Supply unit – Identifying the Faulty Section (functional area approach) – Identifying the Faulty stage.

BOOK FOR STUDY:

1. Audio and Video Systems principles, Maintenance and Troubleshooting by RG GUPTA Tata McGraw Hill Publishing Company limited, New Delhi.

BOOK FOR REFERENCE:

1. Audio Video Systems, S.P.Bali, Rajeev Bali, Khanna publishing house, New Delhi.

QUESTION PAPER PATTERN

Maximum Marks : 75

Exam Duration : 3 hours

Part A : $10 \times 2 = 20$ Answer **ALL** Questions (Two Questions from each unit)

Part B : $5 \times 5 = 25$ Answer **ALL** Questions (Either or Type – Two Question
From (Each Unit))

Part C : $3 \times 10 = 30$ Answer Any **Three** (One Question from each Unit)