THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

DEGREE COURSE

B.Sc. PHYSICS

UNDER CBCS

(with effect from 2008-2009)

The Course of Study and the Scheme of Examinations

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam Hrs	Max. Marks		
								IA	Uni. Exam.	Total
I Year I Semester	I	Language	Paper I		6	3	3	25	75	100
	II	English	Paper I		6	3	3	25	75	100
	III	Core	Paper I	Properties of Matter and Acoustics	5	4	3	25	75	100
	III	Core Practical			4	-	-	-	-	-
	III	Allied	Paper I	Chemistry I **or** Biochemistry I	4	4	3	25	75	100
	III	Allied Practical			3	-	-	-	-	-
	IV			**Environmental Studies**	2	2	3	25	75	100
I Year II Semester	I	Language	Paper II		6	3	3	25	75	100
	II	English	Paper II		6	3	3	25	75	100
	III	Core	Paper II	Thermal Physics and Statistical Methods	5	4	3	25	75	100
	III	Core Practical	Practical I		4	4	3	40	60	100
	III	Allied	Paper II	Chemistry II **or** Biochemistry II	4	4	3	25	75	100
	III	Allied Practical			3	2	3	20	30	50
	IV			**Value Education**	2	2	2	-	50	50
II Year III Semester	I	Language	Paper III		6	3	3	25	75	100
	II	English	Paper III		6	3	3	25	75	100
	III	Core	Paper III	Electricity and Magnetism	4	4	3	25	75	100
	III	Core Practical			2	-	-	-	-	-
	III	Allied	Paper III	Mathematics I	7	5	3	25	75	100

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam Hrs	Max. Marks		
								IA	Uni. Exam.	Total
	IV	Skill based Subject I	Paper I	Electrical Appliances	3	3	3	25	75	100
		Non-Major Elective I	Paper I	Renewable Energy sources	2	2	3	25	75	100
II Year IV Semester	I	Language	Paper IV		6	3	3	25	75	100
	II	English	Paper IV		6	3	3	25	75	100
	III	Core	Paper IV	Optics and Spectroscopy	4	4	3	25	75	100
	III	Core Practical	Practical II		2	4	3	40	60	100
	III	Allied	Paper IV	Mathematics II	7	5	3	25	75	100
	IV	Skill based Subject II	Paper II	Electronics Appliances	3	3	3	25	75	100
		Non-Major Elective II	Paper II	Electrical and Electronics Appliances	2	2	3	25	75	100
III Year V Semester	III	Core	Paper V	Mechanics	5	5	3	25	75	100
	III	Core	Paper VI	Atomic Physics and Crystal Physics	5	5	3	25	75	100
	III	Core	Paper VII	Basic Electronics	5	5	3	25	75	100
	III	Core Practical			6	-	-	-	-	-
	III	Core Practical				-	-	-	-	-
		Elective I	Paper I	Group A (or) B (or) C	6	5	3	25	75	100
	IV	Skill Based Subject III	Paper III	Astrophysics	3	3	3	25	75	100
III Year VI Semester	III	Core	Paper VIII	Nuclear and Radiation Physics	5	5	3	25	75	100
	III	Core	Paper IX	Relativity, Quantum Mechanics and Mathematical Physics	5	5	3	25	75	100
	III	Core Practical	Practical III	General	6	7	3	40	60	100
	III	Core Practical	Practical IV	Electronics		4	3	40	60	100
		Elective II	Paper II	Group A (or) B (or) C	5	5	3	25	75	100
		Elective III	Paper III	Group A (or) B (or) C	6	5	3	25	75	100
	IV	Skill Based Subject IV	Paper IV	TV repair and maintenance	3	3	3	25	75	100
	V	Extension Activities				1				50
				Total	**180**	**140**				**3650**

Students can choose any one of the groups (Elective I, II & III)

GROUP A

Elective 1: Digital Electronics
Elective 2: Applied Electronics
Elective 3: Microprocessors

GROUP B

Elective 1: Materials Science
Elective 2: Applied Electronics
Elective 3: Laser and Fiber Optics

GROUP C

Elective 1: Molecular and Biophysics
Elective 2: Applied Electronics
Elective 3: Medical Physics

THIRUVALLUVAR UNIVERSITY

B.Sc. PHYSICS

SYLLABUS

UNDER CBCS

(with effect from 2008-2009)

I SEMESTER

PAPER I

PROPERTIES OF MATTER AND ACOUSTICS

PROPERTIES OF MATTER

UNIT-I: ELASTICITY

Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ by Searles method

UNIT-II: BENDING OF BEAMS

Bending of beams - Expression for bending moment - Cantilever - Expression for depression at the loaded end - oscillations of a Cantilever - Expression for time period - Determination of Young's modulus by cantilever oscillations Non-uniform bending - Determination of young's modulus by Koenig's method - Uniform bending - Expression for elevation - Experiment to determine young's modulus using pin and microscope method.

UNIT-III: FLUIDS

Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method.

Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication.

Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge – Detection of leakage.

SOUND

UNIT-IV: WAVES AND OSCILLATIONS

Simple harmonic motion - free, damped, forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale.

Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

UNIT-V: ULTRASONICS

Ultrasonic waves - Different modes - Characteristic properties - Behaviour - Focusing - Stationary waves and resonance - Attenuation - Diffraction - Sources of ultrasound. Piezoelectric crystal - Low frequency / high Intensity applications - high frequency - low intensity applications - clinical applications of different scans.

Books for study

1. Properties of matter by Murugeshan R, S Chand & Co. Pvt. Ltd., New Delhi
2. Properties of matter by Brij Lal & Subramaniam, N Eurasia publishing Co., New Delhi, 1989
3. Text book of sound by Brij Lal & Subramaniam, N Vikas Publishing House, New Delhi, 1982
4. Text book of sound by M N Srinivasan – Himalaya Publications (1991)
5. Science and technology of Ultrasonics by Bladevraj, Narosa (2004)

Books for Reference

1. Elements of Properties of Matter by Mathur D S, Shyamlal Charitable Trust, New Delhi, 1993
2. Fundamentals of General Properties of Matter by Gulati H R, R Chand & Co. New Delhi, 1982
3. Waves & Oscillations by Subrahmanyam N & Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 1994
4. A Textbook of Sound by Khanna D R & Bedi R S, Atma Ram & Sons, New Delhi 1985
5. Fundamentals of Physics, 6th Edition by D Halliday, R Resnick and J Walker, Wiley NY 2001.
6. Physics, 4th Edition vols. I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley NY 1994.
7. CRC Handbook of Physics & Chemistry, 80th ED., CR5 Press, NY, 1999
8. The Feynman Lectures on Physics, Vols. I, II and III, by R P Feynman, RB Leighton and M Sands, Narosa, New Delhi, 1998.

ALLIED I

PAPER I

CHEMISTRY I (OR) BIOCHEMISTRY I

CHEMISTRY I

UNIT-I

1.1 Extraction of Metals Minerals and Ore difference - Minerals of Iron, Aluminum and Copper - Ore Dressing or concentration of Ore - Types of Ore Dressing Froth Floatation and Magnetic separation.

1.2 Refining of Metals - Types of Refining - Electrolytic, Van Arkel and Zone Refining.

1.3 Extraction of Uranium and Thorium.

UNIT - II

2.1 Cyclo-alkanes preparation properties of Cyclo-hexane -- Bayers strain theory.

2.2 Polarization - Inductive effect, mesomeric effect and steric effect - (Acid and Base strength.)

2.3 Stereo isomerism - Types, Causes of optical activity of (lactic acid) and tartaric acid - Racemisation - Resolution - Geometrical isomerism - maleic and fumaric acid.

UNIT - III

3.1 Chemical Kinetics - Distinction between Order and Molecularity - derivation of First order rate equation - half life period of first order reaction - determination of rate constant of hydrolysis of ester Catalysis - catalyst - auto catalyst - enzyme catalyst - promoters - catalytic poisoning - Active center - Distinction between homogeneous and heterogeneous catalysts - Industrial application of catalysts.

3.3 Photochemistry - Grothus Drapers law, stark einsteines law - quantum yield - photosynthesis, phosphorescence - fluorescence - chemiluminescence's - photosensitization.

UNIT - IV

4.1 VSEPR Theory - Shapes of Simple Molecules BF_3, PCl_5, SF_6 and XeF_6

4.2 Fuels - Calorific value of fuels - Non-conventional fuels - need of Solar energy - Applications - Bio-fuels.

4.3 Osmosis - Osmotic pressure - reverse osmosis - desalination of sea water.

UNIT - V

5.1 Nuclear Chemistry - Definition of Half life period - Group displacement law - Radioactive series. Nuclear Fission and Fusion - Application of nuclear chemistry in Medicine, agriculture, industries - C^{14} dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking. Naphthalene - Preparations, Properties and uses of Naphthalene - Structure of Naphthalene.

5.3 Elements of symmetry - unit cell - crystal lattice - types of cubic lattice - one example for each.

BIOCHEMISTRY I

UNIT- I :CHEMISTRY OF CARBOHYDRATES.

Definition and classification of Carbohydrates, Linear and ring form of all monosaccharides (Glucose and Fructose), Physical and chemical properties of carbohydrates, Occurrence, structure, physical and chemical properties of disaccharide (Sucrose and Lactose), polysaccharides (Starch and Cellose).

UNIT- II : CHEMISTRY OF AMINO ACIDS.

Definition , classification and properties of Amino acids, isoelectric point, Isoelectric pH, Zwitter ion. Reaction with Ninhydrin, 1-fluro-2, 4, dinitrobenzene [FDNB] and Sieg Fried's carbamino reaction. Essential and Non essential Amino acids.

UNIT-III : CHEMISTRY OF PROTEINS

Classification based on shape and size, solubility and biological function. Peptide bond. Structure of protein - Primary, secondary, tertiary and quaternary. N-Terminal determination - Edmans and dansyl chloride methode. C-Terminal determination. Denaturation.

UNIT-IV: CHEMISTRY OF LIPIDS

Introduction, definition of fatty acids, classification, nomenclatures, structures, properties of fatty acids. Structure and function of prostaglandins, triacyl glycerol, phospholipids [lecithin, cephalin, phosphotidyl inositol, phosphotidyl serine], Spingomyelin, Plasmologen, Glycolipids and Cholesterol. Bile salts Functions.

UNIT-V CHEMISTRY OF NUCLEIC ACID

Definition- Nucleoside, nucleotide and polynucleotide. Double helical structure of DNA and its biological function, structure of RNA: tRNA, mRNA and rRNA- occurrence, chemistry and its biological function, difference between DNA and RNA, Properties - Tm, Hypo and Hyper Chromicity.

BOOKS RECOMMENDED

1. Lehinger's principle of Biochemistry (2000), Nelson and Cox.
2. Harper's Biochemistry - Rober K. Murray, Daryl K.Grammer, McGrawHill, Lange Medical Books
3. Fundamentals of Biochemistry - J.L Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry - Dr. Amit Krishna De, S. Chand & Co., Ltd. et al
5. Biochemistry - Dr. Ambica shanmugam, published by author.
6. Bio molecules - C. Kannan, MJP publishers, Chennai-5

ENVIRONMENTAL STUDIES

(For all UG Degree Courses)

UNIT-I: INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL RESOURCES :

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

UNIT-II: ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION:

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem.

Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity - Insitu & Exsitu.

UNIT-III: ENVIRONMENTAL POLLUTION AND MANAGEMENT

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Land slides. Role of individuals in prevention of pollution - pollution case studies.

UNIT-IV: SOCIAL ISSUES - HUMAN POPULATION

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act - Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

UNIT-V: FIELD WORK

Visit to a local area / local polluted site / local simple ecosystem - Report submission

REFERENCES

1. KUMARASAMY, K., A.ALAGAPPA MOSES AND M.VASANTHY, 2004. ENVIRONMENTAL STUDIES, BHARATHIDSAN UNIVERSITY PUB, 1, TRICHY

2. RAJAMANNAR, 2004, ENVIRONEMNTAL STUDIES, EVR COLLEGE PUB, TRICHY

3. KALAVATHY,S. (ED.) 2004, ENVIRONMENTAL STUDIES, BISHOP HEBER COLLEGE PUB., TRICHY

II SEMESTER

PAPER II

THERMAL PHYSICS AND STATISTICAL METHODS

UNIT-I: TRANSMISSION OF HEAT

Conduction in solids: Thermal conduction - thermal conductivity of a good conductor - theory and determination - Forbe's method - thermal conductivity of a poor conductor - theory and determination - Lee's disc method - relation between thermal and electrical conductivities - Wiedmann-Franz law - practical applications of conduction of heat.

Black body radiation: Stefan-Boltzmann law - determination of Stefan's constant - laboratory method - distribution of energy in the spectrum of a black body - results - Planck's quantum theory of radiation - solar constant - temperature of the Sun - solar spectrum.

UNIT-II: LOW TEMPERATURE PHYSICS

Joule - Kelvin effect - liquefaction of hydrogen - liquefaction of helium- Kammerling-Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature - refrigerators and air-conditioning machines - super fluidity - application of super fluidity - elementary ideas and applications - Superconductivity - Type I and II superconductors - Meissner effect - applications of superconductors - superconducting magnets.

UNIT-III: THERMODYNAMICS I

Zeroth law, I and II law of thermodynamics - Carnot's theorem - thermodynamic scale of temperature - perfect gas scale of temperature - internal combustion engines - Otto engine and Diesel engine - working and efficiency.

UNIT-IV: THERMODYNAMICS II

First latent-heat equation (Clausius-Clapeyron equation) - effect of pressure on melting point and boiling point - second latent-heat equation - III law of thermodynamics - concepts of entropy - temperature entropy diagram - entropy of perfect gas - Maxwell's thermo dynamical relations - derivation - applications - i) Clausius - Clapeyron equation, ii) specific heat relation

UNIT-V: STATISTICAL METHODS

Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Phase space - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.

Books for Study

1. Heat and thermodynamics - Brijlal and Subramaniyam, S Chand & Co.
2. Heat and thermodynamics - J B Rajam, S Chand & Co., New Delhi
3. Thermal Physics - R Murugeshan and Kiruthiga Sivaprasad, S Chand & Co., New Delhi.

Books for Reference

1. Heat and thermodynamics - D S Mathur, S Chand & Co., New Delhi
2. Elements of Statistical mechanics - Gupta and Kumar, Pragati Prakashan, Meerut
3. Statistical mechanics - Sathya Prakash and J P Agarwal, Kedar Nath & Ram Nath & Co., Meerut
4. Introduction to Solid State Physics - C Kittel, Prentice Hall of India

CORE PRACTICAL I

1. Youngs modulus - non uniform bending - pin and microscope
2. Youngs modulus - non uniform bending - optic lever
3. Rigidity modulus - torsional pendulum - without masses
4. Rigidity modulus and moment of inertia - torsional pendulum - with identical masses.
5. Surface tension and interfacial surface tension - drop weight method
6. Coefficient of viscosity of liquid - graduated burette - Radius of capillary tube by mercury pellet method
7. Sonometer - frequency of tuning fork
8. Sonometer - RD of a solid and liquid
9. Specific heat of liquid - Newtons law of cooling
10. Focal length - R and μ of a long focus convex lens
11. Focal length - R and μ of a long focus concave lens
12. Spectrometer - Hollow prism - μ of a liquid
13. Post office box - temperature coefficient of resistance
14. Potentiometer - Calibration of low range voltmeter.
15. Potentiometer - Internal resistance
16. q, n, σ by Searle's method

ALLIED I

PAPER II

CHEMISTRY II (OR) BIOCHEMISTRY II

CHEMISTRY II

UNIT-I

1.1 **Co-ordination Chemistry:**

Nomenclature of co-ordination compounds - Werner Theory of Co-ordination Compound - Chelation - Functions and structure of Haemoglobin and Chlorophyll.

1.2 **Industrial Chemistry:**

Fertilizers and manures - Bio-fertilizers- Organic Manures and their importance - Role of NPK in plants - preparation and uses of Urea, Ammonium nitrate, potassium nitrate and super phosphate of lime.

1.3 Contents in Match sticks and match box - Industrial making of safety matches. Preparation and uses of chloroform, DDT, gamhexane and Freon.

UNIT-II

2.1 **Carbohydrates:**

Classification - structure of glucose - Properties and uses of starch - uses of Cellulose Nitrate - Cellulose acetate.

2.2 **Amino Acid and Protein:**

Classification of Amino Acids - preparation and properties of Glycine - Classification of Protein based on Physical properties and biological functions

2.3 Primary and Secondary structures of protein (Elementary Treatment only) composition of RNA and DNA and their biological role. Tanning of leather - alum (aluminum tri chloride tanning - vegetable tanning)

UNIT-III

3.1 **Electro Chemistry:**

Specific and equivalent conductivity - their determination - effect of dilution of conductance.

3.2 Kohlrawsh Law - Determination of dissociation constant of weak Electrolyte using Conductance measurement - Conductometric Titrations

3.3 P^H and determination by indicator method - Buffer solutions - Buffer action - Importance of buffer in the living system - Derivation of Henderson equation.

UNIT-IV

4.1 Paints - Pigments - Components of Paint - Requisites of a good paint. Colour and Dyes - Classification based on constitution and application.

4.2 **Vitamins:**

Biological activities and deficiency diseases of Vitamin A, B, C, D, E and K - **Hormones** - Functions of insulin and adrenaline.

4.3 Chromatography - Principles and application of column, paper and thin layer chromatography

UNIT-V

5.1 **Drugs-** Sulpha Drugs - Uses and Mode of action of Sulpha Drugs –- Antibiotics - Uses of Penicillin, Chloramphenicaol, streptomycin. Drug abuse and their implication alcohol - LSD

5.2 **Anaesthetics** - General and Local Anaesthetics - Antiseptics - Example and their application. Definition and one example each for analgesics antipyretics, tranquilizers, sedatives, causes for diabetes, cancer and AIDS.

5.3 Electrochemical corrosion and its prevention - fuel cells.

BIOCHEMISTRY II

UNIT-I : METABOLISM

Glycolysis, TCA Cycle, ETC, HMP Shunt and its energy yeids. Deamination, transamination reaction , SGOT and SGPT. Urea cycle, Beta oxidation of fatty acids.

UNIT-II : HORMONES

Brief outline of various endocrine glands and their secretion. Physiological role of insulin, glucagon, thyroid and sex hormones

UNIT-III ENZYMES

Definition classification of enzymes, Mechanism of enzyme action. Lock and key mechanism, induced fit theory. Enzyme specificity, isoenzymes. Factors affecting enzyme activity - pH, temperature, substrate concentration. Michaelis menten equation, Enzyme inhibition - competitive, Non competitive, Un competitive.

UNIT-IV MOLECULAR BIOLOGY

Replication: definition, types, mode of action of replication, mechanism of replication. General mechanism of transcription and translation. Genetic code. DNA and RNA as genetic material.

UNIT-V : VITAMINS AND MINERALS

A brief outline of occurrence and biological functions of Vitamins and Minerals [Na, K, Cl, Ca, P, I, Fe, Mg & S]

BOOKS RECOMMENDED

1. Lehinger's principle of Biochemistry (2000), Nelson and Cox.
2. Harper's Biochemistry - Rober K. Murray, Daryl K.Grammer, McGrawHill, Lange Medical Books
3. Fundamentals of Biochemistry - J.L Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry - Dr. Amit Krishna De, S. Chand & Co., Ltd. et al
5. Biochemistry - Dr. Ambica shanmugam, published by author.
6. Bio molecules - C. Kannan, MJP publishers, Chennai-5

ALLIED PRACTICAL
CHEMISTRY

VOLUMETRIC ANALYSIS

1) Estimation of hydrochloric acid using std. sulphuric acid
2) Estimation of Borax using std sodium carbonate
3) Estimation of sodium hydroxide using std sodium carbonate.
4) Estimation of $FeSO_4$ using std. Mohr salt Solution.
5) Estimation of Oxalic acid using std $FeSO_4$
6) Estimation of FAS using Std oxalic acid
7) Estimation of Fe^{2+} using diphenylamine / N phenyl anthranilic acid as indicator.

ORGANIC ANALYSIS:

Reactions of aldehyde (aromatic), carbhohydrate, carboxylic acid (mono and dicarbox ylic), phenol, aromatic primary amine, amide and diamide. Systematic analysis of organic compounds containing one functional group and characterizationsss by confirmatory tests.

ALLIED PRACTICAL

BIOCHEMISTRY

Volumetric Estimation

1. Estimation of Hcl using Na_2CO_3 as link and NaOH as primary standard.
2. Estimation of Iron in Ferrous Ammonium Sulphate using Potassium permanganate as link solution and Oxalic acid as primary standard.
3. Estimation of Glucose by Benedict's method.
4. Estimation of Glycine by formal titration
5. Estimation of Ascorbic acid.

Qualitative analysis

1. Carbohydrates: Glucose, Fructose, Galactose, Mannose, Maltose, Lactose and Arabinose and Xylulose
2. Amino acids: Arginine, Cysteine, Tryptophan and Tyrosine.

Colorimetric analysis [Only for demonstration]

1. Estimation of Protein by Biuret method
2. Estimation of DNA using Diphenyl amine.
3. Estimation of Glucose by O- Toluidine.

BOOK RECOMMENDED

1. Practical Clinical Biochemistry - Harold Varley, CBS, New Delhi
2. Medical Laboratory Technology - Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.
3. Clinical Biochemistry - Ranjana Chawla.
4. Laboratory manual in Biochemistry - Jayaraman
5. Biochemical methods - S.Sadasivan and Manickam
6. Introduction to practical Biochemistry - David T. Plummer.

VALUE EDUCATION
(For all UG Degree Courses)

UNIT-I

Value Education - Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

UNIT-II

Family values - Components, structure and responsibilities of family - Neutralization of anger - Adjustability - Threats of family life - Status of women in family and society - Caring for needy and elderly - Time allotment for sharing ideas and concerns.

UNIT-III

Ethical values - Professional ethics - Mass media ethics - Advertising ethics - Influence of ethics on family life - psychology of children and youth - Leadership qualities - Personality development.

UNIT-IV

Social values - Faith, service and secularism - Social sense and commitment - Students and Politics - Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms.

UNIT-V

Effect of international affairs on values of life/ Issue of Globalization - Modern warfare - Terrorism. Environmental issues - mutual respect of different cultures, religions and their beliefs.

Reference Books

1. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
2. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.
3. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.

4. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
5. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
6. M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.

WEBSITES AND e-LEARNING SOURCES:

www.rkmissiondhe/.org/education.html/

www.clallam:;org/lifestyle/education.html/

www.sun.com/../edu/progrmws/star.html/

www.infoscouts.com

www.secretofsuccess.com

www.1millionpapers.com

http://militarlyfinance.umuc.edu/education/edu-network.html/

III SEMESTER

PAPER III

ELECTRICITY AND MAGNETISM

UNIT-I: ELECTROSTATICS

Electrostatic potential - electric potential as line integral of electric field - relation between electric potential and electric field in vector form - Poisson's and Laplace's equations - capacitance - capacitance of a spherical and cylindrical capacitor - energy of a charged capacitor - energy density - loss of energy due to sharing of charges. Kelvin's attracted disc electrometer - the quadrant electrometer - heterostatic and idiostatic uses.

UNIT-II: CURRENT ELECTRICITY AND THERMO ELECTRICITY

Carey Foster bridge - theory - determination of temperature coefficient of resistance - calibration of ammeter and voltmeter using a potentiometer - Seebeck, Peltier and Thomson effects - laws of thermoelectric circuits - Peltier coefficient - Thomson coefficient - application of thermodynamics to a thermocouple and expressions for Peltier and Thomson coefficients - thermoelectric diagram and uses.

UNIT-III: CHEMICAL EFFECTS AND MAGNETIC EFFECTS OF ELECTRIC CURRENT

Electrical conductivity of an electrolyte - Faraday's laws of electrolysis - Determination of specific conductivity of an electrolyte (Kohlrausch bridge) - Gibbs Helmholts equation for the emf of a reversible cell - calculation of emf of a Daniel Cell - Helmholtz Galvanometer - Theory of moving coil Ballistic Galvanometer - Damping correction - Absolute capacitance of a capacitor.

UNIT-IV: ELECTROMAGNETIC INDUCTION AND TRANSIENT CURRENTS

Faraday's laws of electromagnetic induction in vector form - determination of self-inductance by Anderson's bridge method and absolute mutual inductance by BG-Ruhmkorff's induction coil - Growth and decay of current in a circuit containing resistance and inductance. Growth and decay of charge in a circuit containing resistance and capacitor - measurement of high resistance by leakage - growth and decay of charge in a LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation.

UNIT-V: MAGNETIC PROPERTIES OF MATERIALS AND MAXWELL'S EQUATIONS

Susceptibility - permeability - intensity of magnetization and the relation $B=\mu_0(H+I)$ - Properties of dia, para and ferro magnetic materials - Langevin's theory of diamagnetism and paramagnetism - Weiss theory of ferromagnetism- antiferrimagnetism and ferrimagnetism Maxwell's equations - displacement current - Maxwell's equations in material media, plane electromagnetic waves in free space-Poynting vector-Hertz experiment for production of electromagnetic waves.

Books for Study:

1. R Murugeshan - Electricity and magnetism, 8th Edn, 2006, S Chand & Co., New Delhi
2. M Narayanamurthy & N Nagarathnam, Electricity & Magnetism 4th Edn, National Publishing Co., Meerut
3. Duggal and Chhabra, Electricity and Magnetism
4. Brijlal, N Subramanyan and Jivan Seshan, Mechanics and Electrodynamics (2005), Eurasia Publishing House (Pvt.) Ltd., New Delhi.

Books for Reference:

1. Sehgal D L, Chopra K L, Sehgal N K – Electricity and magnetism, Sultan Chand & Sons, New Delhi
2. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn., Ratan & Prakash, Agra
3. David J Griffiths, Introduction to Electrodynamics, 2nd Edn. 1997, Prentice Hall of India Pvt. Ltd., New Delhi.
4. Electricity & Magnetism by K K Tewari, S Chand & Co., 3rd Edition, 2001.

ALLIED II

PAPER III

MATHEMATICS I

Objectives of the Course:

To Explore the Fundamental Concepts of Mathematics

UNIT-I: ALGEBRA

Partial Fractions - Binomial, Exponential and logarithmic Series (without Proof) - Summation -Simple problems

UNIT-II : THEORY OF EQUATIONS

Polynomial Equations with real Coefficients - Irrational roots - Complex roots- Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations - Newton's method to find a root approximately - Simple problems.

UNIT-III : MATRICES

Symmetric - Skew-Symmetric - Orthogonal and Unitary matrices - Rank of a matrix -Consistency of equations - Eigen roots and eigen vectors - Cayley-Hamilton theorem (without proof)-Verification and computation of inverse matrix

UNIT-IV: TRIGONOMETRY

Expansions of $\sin^n \theta$, $\cos^n \theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ - Expansions of $\sin \theta$, $\cos \theta$, $\tan \theta$ in terms of θ - Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers.

UNIT-V: DIFFERENTIAL CALCULUS

n-th derivatives - Leibnitz theorem (without proof) and applications – Jacobians - Concepts of polar co-ordinates-Curvature and radius of curvature in Cartesian co-ordinates.

Recommended Text

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics,* Vol. I & II. Muhil Publishers, Chennai.

Reference Books

1. P.Balasubramanian and K.G.Subramanian,(1997) *Ancillary Mathematics.* Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II. Vikas Publications, New Delhi.
3. P.R.Vittal (2003) *Allied Mathematics* . Marghan Publications, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.
5. Isaac, Allied Mathematics. New Gamma Publishing House, Palayamkottai.

SKILLED BASED SUBJECT I

PAPER I

ELECTRICAL APPLIANCES

UNIT-I

Resistance - capacitance - inductance and its units - Transformers - Electrical charge - current - potential - units and measuring meters - Ohm's law - Galvanometer, ammeter, voltmeter and multimeter. Electrical energy - power - watt - kWh - consumption of electrical power.

UNIT-II

AC and Dc - Single phase and three phase connections - RMS and peak values, House wiring - Star and delta connection - overloading - earthing - short circuiting - Fuses - colour code for insulation wires - Inverter - UPS - generator and motor - circuit breaker. Electrical switches.

UNIT-III

Electrical bulbs - Fluorescent lamps - street lighting - flood lighting - electrical fans - wet grinder - mixer - water heater - storage and instant types, electric iron box, microwave oven - Stabilizer, fridge

Books for study:

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

NON-MAJOR ELECTIVE I

PAPER I

RENEWABLE ENERGY SOURCES

UNIT-I

Fossil fuels - their limitations - need for renewable energy - non-conventional energy sources - solar energy - wind energy - wind mills - types - biomass - biochemical conversion - biogas generation - ocean thermal energy conversion - geothermal energy tidal energy - fuel cells.

UNIT-II

Solar energy - importance - storage of solar energy - solar pond - non-convective solar pond - applications of solar pond - applications of solar energy, solar water heater, flat plate collector - solar distillation - solar cooker, drier - solar green houses - solar cell - absorption air conditioning - LiBr-H_2O system

Books for study:

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand & Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd., New Delhi.

IV SEMESTER

PAPER IV

OPTICS AND SPECTROSCOPY

UNIT-I :GEOMETRICAL OPTICS

Convex lens - Optic Centre - Cardinal Points - Principal foci and principal points - Optic centre of a lens - Spherical aberration and lenses - Methods of minimizing spherical aberration - Condition for minimum spherical aberration in the case of two lenses separated by a distance - Chromatic aberration in lenses - Condition for achromatism of two thin lenses (in contact and out of contact) - coma - astigmatism - Ramsden and Huygen's eyepieces - Constant deviation spectrometer - calculation of characteristic wave number of spectral lines.

UNIT-II: INTERFERENCE

Theory of thin films - Air wedge - Determination of diameter of a thin wire by air wedge - Michelson's Interferometer - Theory - Applications - λ , thickness of thin transparent material and resolution of spectral lines - Brewster's fringes - Refractive index of gases - Jamin's & Rayleigh's Interferometers

UNIT-III: DIFFRACTION

Fresnel diffraction - Diffraction at circular aperture, straight edge and single slit - Plane diffraction grating - theory and experiment to determine wavelength - normal incidence - oblique incidence - Fraunhofer diffraction - Missing orders - Overlapping spectra Rayleigh's criteria - Resolving power of telescope, prism, microscope and grating

UNIT-IV: POLARIZATION

Introduction to polarisation - Double refraction-Huygen's explanation of double refraction in uniaxial crystals - Dichroism-Polaroids and their uses Plane, elliptically and circularly polarized light - Production and detection - Optical Activity - Fresnel's explanation of optical activity - Specific Rotatory Power - Determination using Laurent's Half Shade Polarimeter- Kerr effect and Faraday effect.

UNIT-V: SPECTROSCOPY (TECHNIQUES AND INSTRUMENTATION)

Infrared spectroscopy – Raman spectroscopy, Quantum theory and classical theory – Molecular structure.

Basic concepts of Resonance spectroscopy, NMR, ESR experimental setup and any one application.

Semiconductor LASER, MASER – applications of LASER in communication.

Books for Study:

1. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990
2. Optics by Khanna D R & Gulati H R, R Chand & Co. Pvt. Ltd., New Delhi, 1979
3. Optics and Spectroscopy by Murugeshan, S Chand & Co. Pvt. Ltd., New Delhi.

Books for Reference:

1. Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGRaw Hill Inc., New Delhi, 1976.
2. Optical Physics by Lipson. S G, Lipson H and Tannhauser D S, Cambridge University Press (1995)
3. Fundamentals of Optics by Raj M G, Anmol Publications Pvt. Ltd., (1996), New Delhi
4. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.
5. Physics, 4th Edition Vols I, II & II Extended by D Halliday, R Resnick and K S Krane, Wiley, Ny, 1994.
6. CRC Handbook of Physics & Chemistry, 80th Ed., CRS Press, Ny, 1999
7. The Feynman Lectures on Physics, Vols. I, II and III by R P Feynman, R B Leighton and M Sands, Narosa, New Delhi 1998.

CORE PRACTICAL II

1. Youngs modulus uniform bending Pin and Microscope.
2. Youngs modulus uniform bending Scale and Telescope.
3. Youngs modulus - cantilever - depression - static method - scale and telescope.
4. Rigidity modulus - static torsion.
5. Compound pendulum - g and k.
6. Sonometer - AC frequency - steel and brass wires.
7. Thermal conductivity of a bad conductor - Lee's disc method.
8. Spectrometer - μ of a prism - id curve.
9. Spectrometer - grating - N and λ normal incidence method.
10. Spectrometer - grating - N and λ minimum deviation method.
11. Air wedge - thickness of a wire and thickness of enamel coating.
12. m and B_H - Tan C - deflection magnetometer and vibration magnetometer.
13. Carey fosters bridge - Temperature coefficient of resistance.
14. Potentiometer - Calibration of high range voltmeter
15. Potentiometer - resistance and specific resistance of a wire.
16. Figure of merit of a galvanometer - Table Galvanometer.
17. Figure of merit - BG.

SKILL BASED SUBJECT II

PAPER II

ELECTRONICS APPLIANCES

UNIT-I

Passive devices - Resistors - types - characteristics - colour coding - capacitors - type - characteristics - colour coding star and delta connection of resistors and capacitors - chokes - Transformers - testing of diodes, transistors and ICs - Multimeter (analog and digital) - CRO - waveforms and Lissajoue's figures - A/F and R/F oscillators - usage of bread board.

UNIT-II

Semiconductor diode - Zener diode - Transistor - Transistor configurations - diode rectifier - half wave and full wave - Bridge rectifier - Diode voltage doublers and multiplier.

Regulated power supply, Zener diode voltage regulator (Series and Shunt type) IC Voltage regulators: fixed positive - fixed negative - adjustable.

UNIT-III

Basic concepts of radio transmitter and receiver - Basic concepts of TV Trasmitter and receiver - TV antennas: Resonance antennas and their characteristics - Dipole antenna - Folded dipole - Yagi antenna - Yagi antenna design - Dish antenna - DTH system - Mobile communication system - MODEM.

Books for Study:

1. Principles of Electronics by V K Mehta, S Chand & Co., 5th edition 2001.
2. Functional Electronics by Ramanan.
3. Elements of Electronics by Bagde and Singh
4. Monochrome and Colour TV by Gulati
5. Basic Electronics, 6th edition by B Grob, McGraw Hill NY 1989.

NON MAJOR ELECTIVE II

PAPER II

ELECTRICAL AND ELECTRONICS APPLIANCES

UNIT-I: ELECTRICAL APPLIANCES

Transformer - principle - construction details - classification of transformers - testing of transformers

Principle and operation of Fans, Wet grinder, Mixie, Water Heater, Electron iron - Refrigerator - Microwave Oven.

UNIT-II ELECTRONICS APPLIANCES

Introduction to Semiconductor diode - transistor - LED - LCD - Photo diode - Photo transistor - their uses.

Diode rectifiers - half wave and full wave - regulated power supply

TV receivers (qualitative study only) - TV antenna's - Dish antenna

Books for Study:

1. A text book in Electrical Technology - BL Theraja, S Chand & Co.
2. A text book of Electrical technology - A K Theraja
3. Performance and design of Ac machines - M G Say ELBS Edn.
4. Semi conductor physics and opto electronics by P K Palanichamy
5. Basic Electronics - B L Theraja - S Chand & Co.
6. Principles of Communication Engineering - Arokh Singh and A K Chhabra - S Chand & Co.

V SEMESTER

PAPER V

MECHANICS

UNIT-I: DYNAMICS

Rigid body - moment of inertia - radius of gyration - moment of inertia of a solid cylinder, cylindrical shell, solid sphere, spherical shell, hollow sphere with external and internal radii.

Compound pendulum - theory - equivalent simple pendulum - reversibility of centers of suspension and oscillation - determination of g and k - Kater's pendulum

UNIT-II: STATICS AND HYDROSTATICS

Centre of gravity - centre of gravity of a solid and hollow tetrahedron, solid and hollow hemisphere, solid cone centre of pressure - centre of pressure of a vertical rectangular lamina - vertical triangular lamina

Laws of floatation - meta centre - meta centric height of a ship - atmospheric pressure and its variation with altitude - reasons for such variations.

UNIT-III: ROCKETS AND SATELLITES

Rockets and Satellites - basic principles of rocket motion - rocket equation, thrust and acceleration - escape velocity multistage rockets - liquid, solid and cryogenic - propellant rockets - space shutter.

Orbital velocity - launching of a satellite, types of satellite orbits - theory of Geosynchronous satellites - trectory adjustments - launch site tracking, radio televity, block diagram of satellite and earth space probes - exploration of solar systems.

UNIT-IV: CLASSICAL MECHANICS I

Lagrangian formulation of classical mechanics - Mechanics for a system of particles - Generalised co-ordinates - transformation equations - configuration space - Principles of virtual work - D'Alembert's principle - Lagrange's equation - Applications of Lagrange's equation - Compound pendulum - Atwood's machine - Bead sliding on a uniformly rotating wire

UNIT V: CLASSICAL MECHANICS II

Hamiltonian formulation of classical mechanics - phase space - Hamiltonian function - Hamilton's canonical equations of motion - Applications of Hamilton's equations of motion - Simple pendulum - Compound pendulum - linear harmonic oscillator.

Books for study:

1. Mechanics and mathematical methods by R Murugeshan, S Chand & Co. Pvt. Ltd., New Delhi, 1990
2. Elements of mechanics by Gupta
3. Dynamics by Naranamurthi, National Publishing company, Chennai.
4. Classical Mechanics by Gupta Kumar and Sharma,
5. Classical Mechanics by B D Gupta and Sathya Prakash, Kedar Nath Ram Nath & Co.,

Books for Reference:

1. Mechanics by D S Mathur
2. Classical Mechanics by Goldstein, Narosa

PAPER VI

ATOMIC AND CRYSTAL PHYSICS

UNIT-I: DISCHARGE PHENOMENON THROUGH GASES

Moving of a charge in transverse electric and magnetic fields - specific charge of an electron - Dunnington's method - Magnetron method - Positive rays - Thomson parabola method - Aston and Dempster's mass spectrograph.

UNIT-II: ATOMIC STRUCTURE

Vector atom model - Pauli's exclusion principle - explanation of periodic table - various quantum numbers - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - spatial quantisation - Bohr magnetron - Stern and Gerlach experiment

Spectral terms and notations - selection rules - intensity rule and interval rule - fine structure of sodium D lines - alkali spectra - fine structure of alkali spectra - spectrum of Helium.

UNIT-III: IONISATION POTENTIAL AND SPLITTING OF ENERGY LEVELS

Excitation and ionization potential - Davis and Goucher's method - Zeeman effect - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anamalous Zeeman effect - theoretical explanation. Lande's '*g*' factor and explanation of splitting of D_1 and D_2 lines of sodium - Paschen back effect-theory - Stark effect (qualitative treatment only).

UNIT-IV: FUNDAMENTALS OF CRYSTALLOGRAPHY

Space lattice - unit cell - lattice parameters - crystal systems and Bravais lattices - Crystal planes Miller indices - symmetry elements of a Crystalline solid - crystal structure - X-ray diffraction methods - powder crystal and rotating crystal method - working, principle of Scanning Electron Microscope (SEM).

UNIT-V: CRYSTAL GROWTH AND IMPERFECTIONS IN SOLIDS

Crystal growth phenomena - nucleation - different types of nucleation - nucleation parameters of a spherical nucleus - crystal growth techniques - solution growth - solution, solubility and supersaturation - Czochralsky method.

Imperfection in solids: point defect - Frenkel and Schotty defects - Equilibrium - Concentrations - Line defects - Edge dislocation and screw dislocation - surface defects - grain boundary - defects of crystal imperfections.

Books for study

1. Modern physics by R Murugeshan, S Chand & Co., New Delhi - 2004
2. Atomic and Nuclear physics by N Subramanian and Brij Lal, S Chand & Co. - 2000
3. Atomic physics by J B Rajam
4. Crystal growth by J C Brice
5. Introduction to solid state physics, Kittel, Wiley Eastern Ltd., 2003
6. Material science by M Arumugam, Anuradha agencies, Publishers, Vidayalakaruppur - Kumbakonam - 2005
7. Materials science and Engineering by V Raghavan, Prentice Hall of India Private limited, New Delhi 2004

Books for Reference

1. Atomic physics by A B Gupta and Dipak Ghosh - Books and Allied Publishers
2. Modern physics by J H Hamilton and Yang, McGraw Hill Publication 1996
3. Concepts of Modern physics by A Beiser, Tata McGraw Hill, New Delhi 1997
4. Fundamentals of physics, 6^{th} edition, by D Halliday, R Resnick and J Walker, Wiley NY 2001
5. Introduction to solid by Azaroff, Tata McGraw Hill Co. 1997
6. Solid state physics by J S Blakemore, Saunder's company 1974
7. Solid State Physics by A J Dekker, Macmillan India 1985

PAPER VII

BASIC ELECTRONICS

UNIT-I SEMICONDUCTOR THEORY DEVICES AND CHARACTERISTICS

Classification of solids in terms of forbidden energy gap Fermi level - Fermi - dirac function - Carrier concentration intrinsic and extrinsic semi conductors - effect of temperature on Fermi level - PN junction diode - Zener diode - Tunnel diode - photo diode - PIN - APD - Photo transistor - LED, LCD - Solar cell - Transistor construction - different modes of operation - transistor biasing - characteristics in CB & CE modes - α and β of a transistor.

UNIT-II: RECTIFIERS AND AMPLIFIERS

Half-wave, full-wave and bridge rectifier

Two port representation of a transistor - *h*–parameters - AC equivalent circuit using h-parameters - analysis of an amplifier using h-parameters - Expressions for current gain, voltage gain input impedance, output impedance and power gain for common emitter only. RC coupled amplifier - frequency response curve - classification of amplifiers - class A power amplifier - Push-pull, class B power amplifier - Emitter follower.

UNIT-III: FEEDBACK OSCILLATORS

Voltage gain of a feedback amplifier - Barkhausen criterion - Hartley, Colpitt's, phase shift and Weinbridge oscillators - expressions for frequency of oscillations and condition for sustained oscillations in each case - crystal oscillator - frequency stability.

UNIT-IV: WAVE SHAPING CIRCUITS AND MULTI VIBRATORS

Clipping and clamping circuits - biased clipper - integrating and differentiating circuits

Multivibrators - Astable - Mono stable and bi-stable multivibrators - Schmitt trigger

UNIT V RADIO COMMUNICATION AND TELEVISION

Principles of transmission and reception - Modulation - types of modulation - amplitude modulation - frequency modulation and phase modulation - theory and mathematical analysis for AM, FM and PM - detector - AM detector - FM Discriminator - AM and FM transmitter and receiver - Block diagram of TV transmission and reception – principles of colour TV.

Books for study

1. Principles of electronics by V K Mehta, S Chand & Co., 5th edition 2001
2. Elements of electronics by Bagde and S P Singh
3. Functional electronics by Ramanan
4. Monochrome and Colour TVby Gulati
5. Basic and applied electronics by M Arul Thalapathi, Comptek Publishers, Chennai 2005

Books for reference:

1. Electronic principles by Malvino
2. Electronic devices and circuits by Allen Mottershed
3. Monochrome and colour TV Gulati
4. Basic Television and videosystems by B Grob
5. Solid state electronics by Manna, Tata McGraw Hill
6. Basic electronics, 6th edition by B Grob, McGraw Hill, NY 1989

SKILL BASED SUBJECT III

PAPER III

ASTROPHYSICS

UNIT-I : Astronomical instruments

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescope - Radio telescopes - astronomical spectrographs - photographic photometry - photo electric photometry - detectors and image processing.

UNIT-II : Solar system

The sun-physical and orbital data - Photosphere - Chromosphere - corona - solar prominences - sunspot - sunspot cycle - theory of sunspots - solar flare - mass of the sun - solar constant - temperature of the sun - source of solar energy - solar wind. Other members of the solar system - Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto - Moon - Bode's law - Asteroids - comets - Meteors.

UNIT-III: Stellar Evolution, Binary and variable stars

Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae - Supernovae

Binary stars - Origin of Binary stars. Variable stars - Cepheid variables - RV Tauri variables - long period variables - irregular variables - flare stars.

UNIT-IV : Magnitudes, distance and spectral classification of stars

Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement of stellar distance - Geometrical parallax method - distance from red shift measurement - Harvard system of spectral classification .

UNIT-V :Theories of the universe, galaxies and star clusters

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law.

Galaxies - types of galaxies - Milky Way - star clusters - open clusters - globular clusters.

Books for reference:

1. K.S. Krishnasamy, 'Astro Physics a modern perspective,' Reprint, New Age International (p) Ltd, New Delhi,2002.
2. Baidyanath Basu, 'An introduction to Astro physics', second printing, prentice - Hall of India Private limited, New Delhi,2001.
3. R. Murugesan, ' Modern Physics', Eleventh revised edition, S. Chand & Company Ltd, New Delhi, 2003.
4. S. Kumaravelu, 'Astronomy, Janki calendar corporation, Sivakasi, 1993
5. Baker and Fredrick, 'Astronomy, ninth edition, Van No strand Rein hold, Co, New York - 1964.
6. Illustrated World of Science Encyclopedia - Vol I and Vol VIII - Creative world publication - Chicago.

VI SEMESTER

PAPER VIII

NUCLEAR PHYSICS AND RADIATION PHYSICS

UNIT-I: NUCLEAR STRUCTURE

Nuclear spin - determination of magnetic dipole moment, electric quadruple moment, parity of nuclei, isospin, theories of nuclear composition, proton and electron hypothesis, proton - neutron hypothesis, nuclear forces - meson theory of nuclear forces.

Liquid drop model - Bethe-Weizacker's mass formula - application to alpha decay - Bohr - Wheeler theory - Shell model - evidences - theory - energy level diagram - spin orbit interaction - magic numbers - nuclear stability

UNIT-II: NUCLEAR DECAY

Radioactive disintegration - law of successive disintegration - transient and secular equilibrium - radioactive series - Geiger-Nuttal law - Age of earth - alpha particle disintegration energy - alpha particle spectra - theory of alpha decay (qualitative treatment). Beta ray spectra - origin - neutrino theory of beta decay - electron capture - gamma rays - determination of wavelength by Dumond - crystal spectrometer - nuclear isomerism.

UNIT-III: PARTICLE ACCELERATORS AND DETECTORS

Cyclotron - synchrocyclotron - Betatron - electron synchrotron - proton synchrotron (Bevatron) GM counter - ionization chamber - bubble chamber - scintillation counter - photographic emulsion techniques.

UNIT-IV: RADIATION PHYSICS

Nuclear fission - Chain reaction - four-factor formula - reactor theory - critical size of a reactor - general aspect of reactor design - reactor shielding - reactor control - classification of reactors - pressurized heavy water reactor - fast breeder reactor - Radiation hazards - biological effects of radiation - radiation sickness - radiation units and operational limits - radiation survey meters - pocket dosimeter - control of radiation hazards - radiation therapy - radioisotopes used for therapy - nuclear medicine - industrial applications - food preservatives.

UNIT-V: ELEMENTARY PARTICLES

Classification - types of interaction - symmetry and conservation laws - hadrons - leptons - baryons - mesons - strangeness - hyperons - antiparticles - antimatter - basic ideas about quarks - types of quarks.

Books for study

1. Modern physics by R Murugeshan S Chand & Co.
2. Introduction to Modern Physics by Rich Meyer, Kennard, Coop Tata McGraw Hill Publishing Co.
3. Atomic and nuclear physics by Littlefeld & Thorley
4. Modern physics by R Murugeshan & Kiruthiga, Sivaprasath S Chand & Co. (2006)

Books for reference

1. Nuclear Physics S N Ghoshal - S Chand & Co. Edition 2003
2. Nuclear Physics D G Tayal - Himalayan Publishing House
3. Elements of Nuclear Physics - M L Pandya & R P S Yadav Kedar Nath Ram Nath (2000)
4. Nuclear Physics - Irving Keplan
5. Nuclear Physics - J B Rajam, S Chand Publishing Co.

PAPER IX

RELATIVITY, QUANTUM MECHANICS & MATHEMATICAL METHODS

UNIT-I: RELATIVITY

Frames of references - Michelson-Morley experiment - significance of negative result - postulates of special theory of relativity - Lorentz transformation equations - Length contraction - Time dilation - Relativity of simultaneity - Law of addition of velocities - variation of mass with velocity - relativistic kinetic energy equations - postulates of general theory of relativity - gravitational red shift

UNIT-II: WAVE MECHANICS

Matter waves - de Broglie wavelength - wave velocity and group velocity - Heisenberg's Uncertainty principle - proof of Uncertainty principle for one dimensional wave packet - Postulates of wave mechanics - properties of wave functions - operator formalism - eigen functions - eigen values - expectation values

UNIT-III: SCHRŐDINGER EQUATIONS AND ITS APPLICATIONS

Schrödinger equation - time dependent and time independent - application of Schrödinger equations - linear harmonic oscillator - zero point energy - particle in a one dimensional box - barrier penetration and tunneling effect - rigid rotator - hydrogen atom.

UNIT-IV: MATHEMATICAL PHYSICS

Gauss divergence theorem - Stokes theorem - Greens theorem - applications of vectors to hydrodynamics

Orthogonal curvilinear coordinates - spherical polar coordinates - differential operators in terms of orthogonal curvilinear coordinates - expressions for gradient, div, curl and ∇^2 in Cartesian, spherical and cylindrical coordinates.

UNIT-V: SPECIAL FUNCTIONS

Beta and gamma functions - problems - relation between beta and gamma functions - Bessel's differential equations - Legendre's differential equations - Hermite's differential equations - Laguerre's differential equations - series solutions - Dirac delta functions - properties.

Books for study

1. Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.
2. Modern physics by R Murugeshan, Kiruthiga, Sivaprasath S Chand & Co. (2007)
3. Quantum Mechanics by V K Thangappan, Wiley Eastern
4. A Text Book of Quantum Mechanics by P M Mathews and Venkatesan, McGraw Hill
5. Mathematical Physics by Sathya prakash
6. Mechanics and mathematical methods by Murugeshan, S Chand Publishing & Co.

Books for reference

1. Mathematical Physics by B D Gupta
2. Quantum mechanics by Ghatak and Loganathan, McMillan
3. Basic quantum mechanics by A Ghatak, McMillan India (2002)

CORE PRACTICAL III
(ANY TWENTY EXPERIMENTS)

1. Young's modulus - Koenig's method - non uniform bending.
2. Young's modulus - Koenig's method - uniform bending.
3. Newtons rings - R1, R2 and - μ oF material a convex lens.
4. Spectrometer i - I' curve
5. Spectrometer - narrow angled prism - angle of deviation - normal incidence and normal emergence - refractive index.
6. Dispersive power of a prism
7. Dispersive power of a grating
8. Spectrometer - Cauchy's constants
9. Field along the axis of circular coil - deflection magnetometer - M and B_H
10. Field along the axis of circular coil – Vibrating magnetic needle - B_H
11. EMF of a thermocouple – Mirror galvanometer.
12. Potentiometer – emf of a thermocouple
13. Potentiometer – calibration of high range voltmeter.
14. Conversion of galvanometer into a voltmeter
15. BG – Figure of merit for change
16. BG – comparison of Capacitance
17. BG – absolute capacitance of a capacitor
18. BG – comparison mutual inductances
19. BG – absolute mutual inductance of a coil
20. BG – comparison of emfs of two cells.
21. BG – internal resistance of a cell.
22. Transistor characteristics – CB mode
23. Transistor characteristics – CE mode
24. Laser beam – diffraction at a straight wire- determination of thickness of the wire.

CORE PRACTICAL IV
(ANY FIFTEEN EXPERIMENTS)

1. Bridge rectifier – zener diode regulated power supply – 5V-IC regulated power supply.–
2. Single stage amplifier – gain and frequency response
3. Amplifier with feed back
4. Hartely oscillator
5. Colpitt's oscillator
6. Differentiating and integrating circuits.
7. Transistor – Astable multivibrator
8. NAND, NOR as universal gates
9. Half adder and Full adder – Using NAND/NOR gates.
10. Half subtractor and full subtractor ,.
11. Multiplexer and demultiplexer
12. RS, T Flip flops using NAND gates only
13. Four bit ripple counter
14. Shift Register
15. Verification of De Morgan's theorems
16. IC 7490 – Modulus counter
17. Simplification of Boolean expression using Karnaugh map.
18. Number conversion – 8 bit – BCD to binary, Binary to BCD, Hex to ASCII using 8085.
19. Square and square root of BCD and Hex numbers – 8 bit – using 8085.
20. Microprocessor – arranging an array in ascending and descending order.

SKILL BASED SUBJECT IV

PAPER IV

TV MAINTENANCE & REPAIR

UNIT - I

Introduction - types of T.V. - Identification of Components (Resistor, Capacitors, Transistor, I.C) used in T.V. circuits and their properties - applications. Pin Identification - testing methods of various components used in B/W and Colour T.V circuits. Applications of Various instrument using to Repair the T.V. Circuits

UNIT-II

Repairing Procedure for various types of ordinary & SMPS circuits used in B/W & Colour T.V. Low Voltage power supply. High Voltage section - Visual indication of high - voltage defects. Procedure for servicing high voltage circuits.

UNIT-III

Analyzing of B/W T.V Circuits-description of each stage - Voltage and wave form at each stage.

UNIT-IV

Picture tube - installation adjustment - B/W CRT - Envelope - Electron gun and focusing - yoke & centering magnets. B/W CRT circuits controls and adjustments - pin cushion correction - Diagnostic method of servicing

UNIT-V

T.V. Antenna system and Tuner Circuits - functions - types - Applications VHF/UHF - Antenna Calculations - T.V. Boosters - repairing - Printed Circuited Servicing Techniques

Reference Books :

1. Basic Television,Theory & Servicing, A text Lab manual III & IVth Edition Author - Paul B Zbar, Peter W One, (TATA McGRAN HILL Edition)
2. Television Simplified - Milton S. Kiver
3. Modern Television Circuits B/W 20"Vol I to Vol XX (BPB Publications)

4. Modern Television Circuits colour T.V. Vol I to Vol XX (BPB Publications)
5. Portable colour Television circuits Vol I to Vol X (BPB Publications)
6. Modern Portable B/W Television circuits Vol I to Vol III (BPB Publications)
7. I.C substitution & Manual Book
   Complied by – Manahar Lotia BPB Publications
8. Transistor Substitution and Manual Book
   Complied by – Manahar Lotia BPB Publications
9. Modern Remote Control Micro Processor IC
   Complied by – Manahar Lotia BPB Publications

GROUP A

ELECTIVE 1

DIGITAL ELECTRONICS

UNIT-I: DIGITAL FUNDAMENTALS

Number systems - decimal, binary, octal and hexadecimal systems - conversion from one number system to another. Codes - BCD code - Excess 3 code, Gray code - ASCII code - Binary arithmetic - Binary addition - subtraction - unsigned binary numbers - sign magnitude numbers - 1's and 2's complement - Binary multiplication and division.

Logic gates and logic families

AND, OR circuits using diodes and transistors - NOT using transistors - NAND, NOR and EXOR - functions and truth tables. NAND & NOR as universal gates - bipolar and unipolar logic families - RTL NOR - DTL NAND - TTL NAND characteristics of TTL gates - ECL OR / NOR - MOS inverters - CMOS NAND and NOR.

UNIT-II: BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC CIRCUITS

Laws and theorems of Boolean algebra - De Morgan's theorems and their circuit implications - Duality theorem, simplification of Boolean equations - Karnaugh map - pairs, quads, octets - 2,3 and 4 variables - sum of products method - NAND - NAND circuits - product of sums methods - NOR-NOR circuits.

Arithmetic circuits

Arithmetic building blocks - Half adder - Full adder - parallel binary adder - Half subtractor - Full subtractor - The adder-subtractor - digital comparator - parity checker / generator

UNIT-III: DATA PROCESSING CIRCUITS

Multiplexers - Demultiplexers - Decoders - 1 of 16 decoder BCD to decimal decoder - seven segment decoder - Encoders - decimal to BCD encoder - Memory addressing - ROM, PROM, EPROM, PLA - RAM - Dynamic RAM - basic memory cells.

Sequential Logic

Flip - flops - RS Flip Flop - Clocked RS Flip-flop - D flip-flop - JK flip-flop - JK master slave flip-flop - T type flip-flop

UNIT-IV: CLOCKS AND TIMERS

Clock waveforms - TTL clock - 555 timer - astable, monostable - monostable with input logic.

Shift registers and counters - Types of registers - serial in serial out - serial in parallel out - parallel in serial out - parallel in parallel out - ring counter - asynchronous counter - decoding gates - omitted states - modulus counters - BCD counter - up down counter - synchronous counter - combination counters - decade counter - cascaded counters.

UNIT-V: D/A AND A/D CONVERTERS

Introduction - variable resistor network - binary ladder - D/A converter - D/A accuracy and resolution - A/D converter - simultaneous conversion - A/D accuracy and resolution.

Digital applications

Multiplexing displays - frequency counters - time measurement - digital clock - principles - digital voltmeter.

Books for study

1. Malvino and Leech, (2000), Digital Principles and Application, 4th edition, Tata McGraw Hill, New Delhi
2. Millman and Halkias, (1972), Integrated Electronics, International edition, McGraw Hill, New Delhi
3. Arul Thalapapathi, Fundamentals of digital computers, Comptek publishers, Chennai, 1995.

Books for Reference

1. Computer architecture and logic design by T C Bartee, McGraw Hill, 1991.2
2. Solid state electronics by I Agarwal and Anit Agarwal
3. Digital integrated electronics by Herbert Taub and Donald Schilling, McGraw Hill
4. Anokh Singh and A K Chhabra, (2005), Fundamentals of Digital Electronics and Microprocessors, 2nd revised and enlarged Ed., S Chand & Co. Ltd., New Delhi
5. Digital fundamentals – Floyd – Pearson Education 8th Edition 2004 S Chand Publications

ELECTIVE 2

APPLIED ELECTRONICS

UNIT-I: SPECIAL DEVICES AND APPLICATIONS

FET - Characteristics - parameter FET as amplifier - FET as VVR - MOSFET - Depletion and enhancement - UJT characteristics - UJT as relaxation oscillator - SCR characteristics - SCR as half wave rectifier and full wave rectifier. SCR as static current switch - Firing of SCR using UJT - DIAC - TRIAC.

UNIT-II: OPERATIONAL AMPLIFIER AND APPLICATIONS:

OPAMP - Parameters - Inverting and Non-inverting amplifier - gain - Miller effect - Virtual ground - offset voltage - offset current - PSRR - CMRR.

OPAMP - Sign and Scale changer - adder, subtractor and averager - Integrator and differentiator - DC voltage follower - ac voltage follower - solving simultaneous linear equation - solving differential equation of second order.

UNIT-III: OTHER APPLICATION OF OPAMP

OP AMP logarithmic amplifier - antilogarthmic amplifier - Logarithmic multiplier - Logarithmic divider. Comparator - Schmitt trigger - astable multivibrator - monostable multivibrator - Bistable multivibrator - Hartley oscillator - Colpitt's oscillator - Wein Bridge oscillator- Phase shift oscillator.

UNIT-IV: 555 TIMER AND PLL

555 block diagram and work monostable operation - Astable operation - Schmitt trigger.

Phase - Locked Loops (PLL): Basic principles - Phase Detector

Comparator - Analog phase detector - Digital phase detector - voltage controlled oscillator (VCO). PLL applications: Frequency multiplication / Division by PLL - Frequency translation - AM Detection - FM Demodulation.

UNIT-V: D / A AND A/D CONVERTER

Weighted resistor D/A converter - 4-bit R-2R ladder DAC - Analog to Digital converter - Stair case ADC - tracking or servo ADC - Successive approximation ADC - Flash ADC Duel slope ADC.

Books for study

1. Basic and Applied Electronics by M. Arul Thalapathi - Comtek publisher Chennai / 2005.
2. Digital principles and applications - Malvino Leach - 4th Edn. - Tata McGraw Hill 1992.
3. Integrated Electronics by Jacob Millman and Christos C. Halkias - McGraw Hill international 1971.
4. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New age international (P) Ltd.
5. OP-AMPS and linear integrated circuits - by Ramakant A. Gayakward - Printice Hall of India 1994.

Books for Reference

1. Digital computer electronics by Albert Paul Malvino - TMH Edition 1992.
2. Electronics - Analog and Digital - IJ Jagrath - Prentice - Hall of India - New Delhi - 1999.
3. Operational amplifier and linear integrated circuits - prentice Hall Inc. N.J. 1977.

ELECTIVE 3

MICROPROCESSOR AND ITS APPLICATIONS – 8085.

UNIT-I: MICROPROCESSOR ARCHITECTURE AND ITS OPERATIONS

Microprocessors - Architecture of 8085 - pin out configurations of 8085 - Bus organization and timings: buses - buffer - address bus, data bus, multiplexing address/data bus and control & status signals - ALU - registers in 8085 - flags- decoding and execution of instruction - Interrupts: maskable and nomaskable interrupts - 8085 interrupts - interrupt priorities.

UNIT-II: PROGRAMMING MODEL OF 8085

Classification of instructions and format - 8-bit data transfer, arithmetic, logical and branch instructions - Addressing modes - 16 bit data transfer and memory related instructions - stack and subroutine instructions- comparison of stack and subroutine instructions - Logical rotate and compare instructions - RIM and SIM interrupt instructions - 8-bit code conversion: Binary to BCD, BCD to binary, binary to ASCII, ASCII to binary, BCD to ASCII and ASCII to BCD - instruction timings and operation status - looping, counting and indexing - static and dynamic debugging of a program.

UNIT-III: TIME DELAY, DESIGN OF COUNTERS AND MEMORY INTERFACE

Counters - time delay using one and pair of registers - hexadecimal counter - zero to nine counter - resetting and displaying flags of 8085- Instruction timings of 8085 - T-states - delay routines and delay calculations - traffic signal controller.

Memory interface: 2K X 8, 4K x 6 ROM and RAM interface - timing diagram for memory read and memory write cycles- instructions cycle, machine cycle.

UNIT-IV: INTERFACING I/O DEVICES

Interfacing concepts - peripheral I/O instructions - interfacing input and output using decoders - interface of LED output display for binary data - Memory mapped I/O - LED display of binary data - comparison of peripheral I/O and memory mapped I/O - Direct memory access (DMA).

UNIT-V: INTERFACING DATA CONVERTERS AND PERIPHERAL DEVICES

Concepts of D/A and A/D converters and circuits - illustration of interfacing 8-bit D/A and successive approximation A/D converters - basics of programmable I/Os - interfacing of programmable peripheral device 8255 - programming 8255A MODE zero - interfacing with A/D converter in BSR mode - interfacing with ports of 8255 with LED's to run various counters..

Books for study:

1. Microprocessor Architecture, Programming and applications with the 8085 - R.S. Goankar, 3rd Edn. Prentice Hall.
2. Fundamental of Microprocessor - 8085 - Architecture, programming and interfacing - V. Vijayendra, S. Viswanathan, Pvt., Ltd. 2003.

Books for reference:

1. Digital computer electronics: an introduction to microcomputers - Malvino, 2nd Edn., Tata McGraw Hill.
2. Fundamentals of Microprocessors and microcomputers - B. Ram.
3. Computer system architecture - Moris Mano, 3rd Edn., Prentice Hall India.
4. Introduction to microprocessors: software, hardware, programming - Lance A. Leventha, Prentice Hall India.

GROUP B

ELECTIVE 1

MATERIALS SCIENCE

UNIT- I: MATERIAL SCIENCE

Classification of materials - Properties of Engineering materials - Materials Structure - Types of Bonds - Bonds formation - Ionic Bond - Covalent Bond - Metallic Bond - Comparison of Bonds - Secondary Bonds - Crystals systems - Crystals Imperfection - Point, line and surface Imperfection - Dislocation - Salient Points.

UNIT-II: PHASE DIAGRAM AND TRANSFORMATION

Basic terms - Solid solution - Hume - Rothery's rule - Intermediate Phase - Phase Diagrams- Gibb's Phase rule - Time-Temperature cooling curves - Construction of Phase Diagrams - The Lever Rule - Equilibrium Binary system - Eutectic systems - Mechanism of Phase Transformation - Types of Nucleation - Application of Phase Transformation

UNIT-III: VACUUM, OXIDATION AND CORROSION

History of vacuum technology - units of Vaccum - Kinetic aspects of Gases - Application of Vaccum - Gas flow in vaccum systems - production of vaccum - Measurement of vaccum - Thermal conductivity gauges - Penning Gauge - Oxidation - Oxidation Resistant Materials - Corrosion - Principle - Types of Corrosion - Prevention against corrosion.

UNIT-IV: NON-DESTRUCTIVE TESTING (NDT)

NDT and its advantages - Defects in materials - Selection of the NDT Method - Visual Inspection - Basic Principle - Liquid Penetration Testing - Physical Principle - Magnetic Particle Testing (MPT) - Principle of MPT - Sensitivity - Limitation - Eddy Current Testing (ECT) - Principle - Instrument for ECT - Applications - Limitations - Radiography - Basic Principle - Application - Limitations - Ultrasonic Flaw Detection - Principle - Equipment details (Block Diagram) - Thermography - Basic Principle - Application.

UNIT –V: ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

Dielectrics - Polarization - Temperature and frequency effects - Electric Breakdown - Ferroelectric materials - Electrostriction - Piezoelectricity - Uses of Dielectrics - Magnetic Properties - Classification - Magnetostriction - Soft and Hard magnetic materials.

Books for Study:

1. Materials Science by G.K. Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill Publishing, 1994.
2. Materials Science and Engineering by V. Raghavan, Prentice Hall of India, 2004.
3. Practical Non-Destructive Testing by Baldevraj, T. Jayakumar, M. Thanvasimuthu, Narosa Publishing House, Chennai, 2002.
4. Testing of Metallic Materials by A.V.K. Suryanarayana, B.S. Publications, Giriraj lane, Sultan Bazar, Hyderabad - 95, 2003.

ELECTIVE 2

APPLIED ELECTRONICS

UNIT – I SPECIAL DEVICES AND APPLICATIONS

FET – Characteristics – parameter FET as amplifier – FET as VVR – MOSFET – Depletion and enhancement – UJT characteristics – UJT as relaxation oscillator – SCR characteristics – SCR as half wave rectifier and full wave rectifier. SCR as static current switch – Firing of SCR using UJT - DIAC – TRIAC.

UNIT – II OPERATIONAL AMPLIFIER AND APPLICATIONS:

OPAMP – Parameters – Inverting and Non-inverting amplifier – gain – Miller effect – Virtual ground – offset voltage – offset current – PSRR – CMRR. OPAMP – Sign and Scale changer – adder, subtractor and averager – Integrator and differentiator – DC voltage follower – ac voltage follower – solving simultaneous linear equation – solving differential equation of second order.

UNIT – III OTHER APPLICATION OF OPAMP

OP AMP logarithmic amplifer – antilogarthmic amplifier – Logarithmic multiplier – Logarithmic divider. Comparator – Schmitt trigger – astable multivibrator – monostable multivibrator – Bistable multivibrator – Hartley oscillator – Colpitt's oscillator – Wein Bridge oscillator- Phase shift oscillator.

UNIT – IV 555 TIMER AND PLL

555 block diagram and work monostable operation – Astable operation – Schmitt trigger.

Phase – Locked Loops (PLL): Basic principles – Phase Detector

Comparator – Analog phase detector – Digital phase detector – voltage controlled oscillator (VCO). PLL applications: Frequency multiplication / Division by PLL – Frequency translation – AM Detection – FM Demodulation.

UNIT – V D / A AND A/D CONVERTER

Weighted resistor D/A converter – 4-bit R-2R ladder DAC – Analog to Digital converter – Stair case ADC – tracking or servo ADC – Successive approximation ADC – Flash ADC Duel slope ADC.

Books for study

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3. Operational amplifier and linear integrated circuits - prentice Hall Inc. N.J. 1977.

ELECTIVE 3

LASER AND FIBER OPTIC COMMUNICATION

UNIT-I: LASER PHYSICS

Basic Principle of Laser - Einstein Coefficients - condition for light amplification - Population Inversion - Threshold Condition - Line shape function - Optical Resonators - Three level and four level systems.

UNIT-II: TYPES OF LASERS AND OUTPUT MODULATION METHODS

Solid State lasers - Ruby and Nd-YAG Laser - Gas lasers - He-Ne and Co_2 lasers - semiconductor lasers - Heterojunction lasers - Liquid Dye lasers - Q switching and mode locking.

UNIT-III: APPLICATIONS OF LASER

Application of laser in industry - cutting and welding - Drilling - surface Hardening - Medical applications - laser as diagnostic and therapeutic tool - Holography - Theory of recording and reconstruction - application of Holography.

UNIT-IV OPTIC FIBERS

Fiber optic revolution - basic characteristics of optical fiber - acceptance angle - numerical aperture - propagation of light through optical fiber - theory of mode formation - classification of fibers - step index and graded index fibers - single mode and multi mode fibers - losses in fibers - fabrication techniques of fibers.

UNIT-V: FIBER OPTIC COMMUNICATION

Source and detectors for fiber optic communication - Laser and LED - Analog and digital modulation methods - Principle of optical detection - pin and APD photodetectors - Noise - Design consideration of a fiber optic communication system.

Books for study

1. Laser theory and applications by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.
2. An Introduction to laser: Theory and Applications by M. N. Avadhanulu, S. Chand and Co., New Delhi 2001.
3. Introduction to Fiber optics by K. Thyagarajan and Ajoy Ghatak, Cambridge University Press, 1999.
4. Optical Fiber communications by John M. Senior, Cambridge University Press, 1996
5. Fiber-Optic communication systems, Govind P. Agrawal, John-Willey & Sons,
6. P.K. Palanisamy, Physics for Engineering, Scitech Publishing Pvt. Ltd, Chennai.

GROUP C

ELECTIVE 1

MOLECULAR BIOPHYSICS

UNIT-I: ESSENTIAL CONCEPTS OF PHYSICS AND CHEMISTRY

Electronic structure of atoms - bond formation - hybridization of orbitals - molecular orbitals - bond length - bond length-bond angle-bond energy - covalent bonds - polarity in covalents bonds-ionic bonds-dipole moments of bonds and molecules-hydrogen bonds-Vander Waals forces – Apolar binds-free radicals - Asymmetric Carbon - isomerism - types - chirality - stereochemical nonmenclature - enthalpy - free energy - entropy - chemical potential - Redox potential-viscosity-biological significance of viscosity-surface tension-biological significance of surface tension-adsorption-biological significance of adsorption-hydrogen ion concentration (p^H) - ^{pH} scale - pHmeter - factors affecting pH^- buffers - importance of buffers in biological systems.

UNIT-II: BIOLOGICAL MEMBRANES AND MOVEMENT OF SUBSTANCES ACROSS CELL MEMBRANE

Cell membranes-diffusion-Fick's law of diffusion-passive diffusion-facilitated diffusion-factors affecting diffusion-diffusion across cell membranes-active transport osmosis-osmotic pressure-laws of osmosis-biological significance of osmosis.

Macromolecules

Nuclei acids - heterocyclic bases-nucleosides-nucleotides-primary, secondary and tertiary structure of DNA-Ribo nucleic acid (RNA) amino acids-primary structure of proteins-peptide bond-secondary, tertiary and quaternary structure of proteins-structure of virus-protein-protein interactions-protein-ligand interactions-carbohydrates-monosaccharides - disaccharides - polysaccharides - glycoproteins - lipids - Phospholipids - lipoproteins - antigens - antibodies.

UNIT-III: NEURO BIO PHYSICS

Nervous system-synapse-physics of membrane potentials and nerve impulse conduction-Eye-visual receptor-electrical activity and visual generator potentials-optical defects of the eye-neural aspects of vision-bio luminesence-Ear-Phono receptors-auditory function-sensitivity of a dectector and the Weber-Fechner law-Hearing aids-basic components of hearing aids-types of hearing aids.

Microscopy

Electron microscopy: Electron optics-transmission electron microscopy (TEM) - scanning electron microscopy (SEM) preparation of specimen for electron microscopy-tunneling electron microscopy-atomic force microscopy.

UNIT-IV: BIOENERGETICS

Cellular bioenergetics - whole body bioenergetics-scheme of bioenergetics-laws of thermodynamics-endergonic and exergonic reactions-oxidation/reduction reactions catabolism and anabolism-enzymes- allosteric interactions-competitive inhibition-noncompetitive inhibition.

Photobiology

Absorption-primary photochemical reactions-basic laws of photochemical reactions-quantum efficiency-photosynthesis-Calvin cycle-chlorophyll and accessory pigments-photosynthetic energy transformation-chloroplast structure and organization-stages of photosynthesis-light reaction-dark reaction-polarization-limiting factors in photosynthesis.

UNIT-V: RADIATIONS AND THEIR INTERACTIONS WITH MATTER.

Electromagnetic radiation- ultra violet and visible spectroscopy-fluorescence and phosphorescence methods-infrared spectroscopy-near, mid and far infrared regions-instrumentation-Raman spectroscopy-optical activity-optical rotatory dispersion (ORD) and circular dichroism (CD) - ORD and CD instrumentation-Nuclear magnetic resonance spectroscopy-instrumentation - electron spin resonance spectroscopy.(ESR) instrumentation - mass spectrometry (MS) - radioactivity - alpha, Beta and gamma rays-half life period-detection and measurement of radioactivity-Geiger-Muller counter-scintillation counter - semiconductor detectors-applications of radioactivity: radioactive tracers-radio carbon dating-X-ray diffraction: Single crystal and powder diffraction methods (elementary ideas) - biological effects of radiation.

Books for study and reference

1. Bio Physics by Vasantha Pattabhi and N. Gautham, Narosa publishing house, New Delhi, 2005
2. Advanced biophysics by S. K. Agarwal, APH Publishing Corporation, New Delhi, 2005.

3. Bio physics principles and techniques by M.A Subramanian, MJP publishers, chennai, 2005
4. Basic biophysics for biologists by M. Daniel, Agrobios (India), Jodhpur, 2003.
5. Essential of biophysics by P. Narayanan, New age International (P) limited, New Delhi, 2005
6. Biophysics by W. Hoppe, W. Lohman, H. Markl and H. Zeigler, Springer-Verlag, New York, 1989.
7. Biophysics an introduction by Rodney cotterill, John Wiley and sons Ltd, England, 2002.

ELECTIVE 2

APPLIED ELECTRONICS

UNIT-I: SPECIAL DEVICES AND APPLICATIONS

FET - Characteristics - parameter FET as amplifier - FET as VVR - MOSFET - Depletion and enhancement - UJT characteristics - UJT as relaxation oscillator - SCR characteristics - SCR as half wave rectifier and full wave rectifier. SCR as static current switch - Firing of SCR using UJT - DIAC – TRIAC.

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UNIT-III: OTHER APPLICATION OF OPAMP

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UNIT-IV: 555 TIMER AND PLL

555 block diagram and work monostable operation - Astable operation - Schmitt trigger.

Phase - Locked Loops (PLL): Basic principles - Phase Detector

Comparator - Analog phase detector - Digital phase detector - voltage controlled oscillator (VCO). PLL applications: Frequency multiplication / Division by PLL - Frequency translation - AM Detection - FM Demodulation.

UNIT-V: D / A AND A/D CONVERTER

Weighted resistor D/A converter - 4-bit R-2R ladder DAC - Analog to Digital converter - Stair case ADC - tracking or servo ADC - Successive approximation ADC - Flash ADC Duel slope ADC.

Books for study

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3. Operational amplifier and linear integrated circuits - prentice Hall Inc. N.J. 1977.

ELECTIVE 3

MEDICAL PHYSICS

UNIT-I: X-RAYS

Electromagnetic spectrum - production of x-rays - x-ray spectra - Brehmsstrahlung - Characteristic x-ray - X-ray tubes - Coolidge tube - x-ray tube design - tube cooling - stationary mode - Rotating anode x-ray tubes - Tube rating - quality and intensity of x-ray. X-ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator - exposure timers - HT cables.

UNIT-II: RADIATION PHYSICS

Radiation units - exposure - absorbed dose - rad gray - kera relative biological effectiveness - effective dose - sievert - inverse square law - interaction of radiation with matter - linear attenuation coefficient. Radiation Detectors - Thisble chamber - condenser chambers - Geiger counter - Scintillation counter - ionization chamber - Dosimeters - survey methods - area monitors - TLD and semiconductor detectors.

UNIT-III: MEDICAL IMAGING PHYSICS

Radiological imaging - Radiography - Filters - grids - cassette - X-ray film - film processing - fluoroscopy - computed tomography scanner - principle function - display - generations - mammography. Ultrasound imaging - magnetic resonance imaging - thyroid uptake system - Gamma camera (Only Principle, function and display)

UNIT-IV: RADIATION THERAPY PHYSICS

Radiotherapy - kilo voltage machines - deep therapy machines - tele-cobalt machines - Medical linear accelerator. Basics of Teletherapy units - deep x-ray, telecobalt units, medical linear accelerator - Radiation protection - external beam characteristics - phantom - dose maximum and build up - bolus - percentage depth dose - tissue - air ratio - back scatter factor.

UNIT-V: RADIATION PROTECTION

Principles of radiation protection - protective materials - radiation effects - somatic, genetic stochastic and deterministic effect, Personal monitoring devices - TLD film badge - pocket dosimeter.

Books for study:

1. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)
3. Physics of Radiation Therapy : FM Khan - Williamd and Wilkins, Third edition (2003)
4. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
5. HE Johns and Cunningham - The Physics of Radiology.

Books for Reference:

1. Nuclear medicine physics: Chandra - Lippincot Williams and Wilkins (1998)
2. The Physics of radiology: John R Gunni ingham and Johns - Charles C Thomas USA (1990)
3. Medical Imaging Physics : William R Hendee - Mosby, 3rd edition (1992)
4. Advanced Medical Radiation Dosimetry: Govindarajan KN Prentice - Hall of India Pvt. Ltd. New Delhi (1992)
5. Erric Hall Radio Biology for the Radiologist - Lippincott Williams & Wilkins.
6. The Modern Technology of Radiation oncology - Jake VanDyk - Medical Physics Publishing.

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