## THIRUVALLUVAR UNIVERSITY

### BACHELOR OF SCIENCE

### B.Sc. PHYSICS

#### DEGREE COURSE

**CBCS PATTERN**

*(With effect from 2012 - 2013)*

The Course of Study and the Scheme of Examinations

<table>
<thead>
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<th>S.NO.</th>
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<th>Study Components</th>
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<th>Credit</th>
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ELECTIVE SUBJECTS

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

GROUP A

Elective 1: Digital Electronics
Elective 2: Applied Electronics
Elective 3: Microprocessor and its Applications – 8085

GROUP B

Elective 1: Materials Science
Elective 2: Applied Electronics
Elective 3: Laser and Fibre Optic Communication

GROUP B

Elective 1: Fundamentals of Nano Materials and its Characterization
Elective 2: Applied Electronics
Elective 3: Medical Physics
THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

B.SC. PHYSICS

SYLLABUS
UNDER CBCS
(with effect from 2012 - 2013)

SEMESTER I

PAPER – 1

PROPERTIES OF MATTER AND ACOUSTICS

UNIT – I : ELASTICITY


UNIT – II : BENDING OF BEAMS


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.


**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**


**Books for study:**


Science and Technology of Ultrasonics by Baldevraj, Narosa [2004].
Books for reference:


ALLIED - 1

PAPER – 1

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 BF3, PCl5, SF6 and XeF6


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

UNIT - V


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.
B.Sc. Physics: Syllabus (CBCS)

ALLIED – 1

PAPER – 1

BIOCHEMISTRY – I

UNIT - I

Chemistry of Carbohydrates: Definition and Classification of carbohydrates, linear and ring forms (Haworth formula) for monosaccharides for glucose and fructose. Disaccharides-sucrose and lactose. Physical properties-mutarotation and kiliani cyanohydrin synthesis. Chemical properties-Oxidation, reduction, osazone formation. Disaccharide-sucrose and lactose-occurrence, structure; Physical and chemical properties. Polysaccharides: starch and cellulose-occurrence, structure, physical and chemical properties.

UNIT - II

Chemistry of aminoacids: Definition and classification of aminoacids, common properties of aminoacids, amphoteric nature, isoelectric point, iselectric pH and Zwitter ion. Reaction with ninhydrin, 1-fluoro-2, 4-dinitronitrobenzene (FDNB) and Sieg Fried—s carbamino reacion.

UNIT - III


UNIT - IV

Chemistry of Lipids: Definition, classification and functions. Occurrence, chemistry and biological functions- simple lipids: tertiary compound lipids (e.g. phospholipids), derived lipids: steroids (e.g. cholesterol). Saturated fatty acids: arachidic acid. Unsaturated fatty acids: linolenic acid. Physical property - emulsification. Chemical properties-saponification, rancidity, definition of acid number, saponification number, iodine number and Reichert-Meissl number. Bile acid and bile salt functions.
UNIT - V

Chemistry of Nucleic acids: Definition, nucleoside, nucleotide and polynucleotide. Double helical model of DNA and its biological functions. Structure of RNA: tRNA, mRNA and rRNA—occurrence, chemistry and its biological functions. Differences between DNA and RNA properties: cot curve and cot value, Tm, hypo and hyper chromicity.

References:


4. Biochemistry—Dr. Amit Krishna De, S. Chand & Co., Ltd.

5. Biochemistry—Dr. Ambika Shanmugam, Published by Author.

SEMESTER II

PAPER – 2

THERMAL PHYSICS AND STATISTICAL METHODS

UNIT – I : TRANSMISSION OF HEAT


UNIT – II : LOW TEMPERATURE PHYSICS


UNIT – III : THERMODYNAMICS I


UNIT - IV : THERMODYNAMICS II

UNIT – V : STATISTICAL METHODS


Books for study:

Heat and thermodynamics – Brijlal and Subramaniyam, S Chand & Co.


Books for Reference:

Heat and thermodynamics – D S Mathur, S Chand & Co., New Delhi

Elements of Statistical Mechanics – Gupta and Kumar, Pragati Prakashan, Meerut.


Introduction to Solid State Physics – C Kittel, Prentice Hall of India.
CORE PRACTICAL

PAPER 1 & 2

(Any 16 Experiments)

1. Youngs modulus – non uniform bending – pin and microscope.
8. Comparison of viscosities – ($\eta_1/\eta_2$).
9. $\eta$, $n$, $\sigma$ by Searle’s method.
10. Rigidity modulus – Static torision – Mirror scale and telescope.
11. Compound Pendulum – Determination of ‘$g$’ and ‘$k$’
16. Focal length – R and $\mu$ of a long focus convex lens.
17. Auto collimation method
18. Auxillary Lens Method
19. Focal length – R and $\mu$ of a long focus concave lens.
20. Combination Method
21. Auxillary Lens Method
22. Spectrometer – Hollow prism – $\mu$ of a liquid.
23. Potentiometer – Calibration of low range voltmeter.
ALLIED – 1

PAPER – 2

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

3.3 PH 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, Chloramphenical, 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.
ALLIED – 1

PAPER – 2

BIOCHEMISTRY – II

UNIT - I
Metabolism Glycolysis, TCA cycle, HMP shunt and its energy yield. Deamination, transamination reaction, SGOT and SGPT. Urea cycle, Biosynthesis of fatty acids, beta oxidation.

UNIT - II
Metabolic Disorders Jaundice, hypoxia, glycogen storage diseases, pentosuria, ketosis, lipidosis, edema, gout. Dehydration: definition, causes, symptom and prevention.

UNIT - III

UNIT - IV

UNIT - V
Vitamins and Minerals A brief outline of occurrence and biological function of Vitamins and minerals (Na, K, Cl, Ca, P, I, Fe, Mg & S)
References:


4. Biochemistry—Dr. Amit Krishna De, S. Chand & Co., Ltd.

5. Biochemistry—Dr. Ambika Shanmugam, Published by Author.

ALLIED PRACTICAL

CHEMISTRY – I & II

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 FeSO4 using std. Mohr salt Solution.
5) Estimation of Oxalic acid using std FeSO4
6) Estimation of FAS using Std oxalic acid
7) Estimation of Fe2+ using diphenylamine / N phenyl anthranilic acid as indicator.

ORGANIC ANALYSIS:

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

BIOCHEMISTRY I & II

PRACTICAL I

Volumetric Estimation

1. Estimation of HCl using Na₂CO₃ 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.

PRACTICAL II

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.

Books Recommended:

4. Laboratory manual in Biochemistry - Jayaraman.
5. Biochemical methods - S.Sadasivan and Manickam.
6. Introduction to Practical Biochemistry - David T. Plummer.
SEMESTER III

PAPER – 3

ELECTRICITY

UNIT – I : ELECTROSTATICS

Gauss’ Law – Electric Field due to uniformly charged sphere – Electric Intensity - 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 – loss of energy due to sharing of charges. The quadrant electrometer – heterostatic and idiostatic uses.

UNIT – II : CURRENT ELECTRICITY


UNIT – III : THERMO ELECTRICITY

Seeback, 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

UNIT – IV : ELECTRO MAGNETIC INDUCTION


UNIT – V : TRANSIENT CURRENT

Growth and decay of current in a circuit containing resistance and inductance. Growth and decay of charge in 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.
Books for study:


Duggal and Chhabra, Electricity and Magnetism.


Books for reference:


ALLIED – 2

PAPER – 3

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 $\theta$ - 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

Reference Books


SKILLED BASED SUBJECT

PAPER – 1

ELECTRICAL APPLIANCES

UNIT – I
Resistance and its types – capacitance and its types – Colour codes-inductance and its units –
Transformers – Electrical Charge – Current – Electrical Potential

UNIT - II
Ohm’s law – Galvanometer, Ammeter, Voltmeter and Multimeter Analog and Digital - Electrical
Energy – Power – Watt – kWh – Consumption and electrical power.

UNIT – III
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

UNIT - IV
Inverter – UPS – generator and motor – types – different types of windings – circuit breaker -
Electrical switches and its types.

UNIT – V
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:
A text book in Electrical Technology – A K Theraja.
Performance and design of AC machines – M G Say ELBS Edn.
NON – MAJOR ELECTIVE

PAPER – 1

RENEWABLE ENERGY SOURCES

Unit - I: Conventional Energy Sources

The fossil fuels - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits – fuel cells.

Unit - II: Solar Energy


Unit - III: Biomass energy fundamentals

Biomass energy – classification – photosynthesis – Biomass conversion process

Unit - IV: Biomass Utilization

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

Unit - V: Other forms of energy sources

Geothermal energy – wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

Books for Study:


Books for Reference:

SEMESTER IV

PAPER – 4

MECHANICS

UNIT – I : DYNAMICS


UNIT – II : STATICS AND HYDROSTATICS


UNIT – III : ROCKETS AND SATELLITES


UNIT – IV : CLASSICAL MECHANICS I


UNIT – V : CLASSICAL MECHANICS II

Books for study:

Mechanics and mathematical methods by R Murugesn, S Chand.

Elements of mechanics by Gupta.

Dynamics by Naranamurthi, National Publishing Company, Chennai.

Classical Mechanics by Gupta Kumar and Sharma.

Classical Mechanics by B D Gupta and Sathya Prakash, Kedar Nath Ram Nath & Co.,

Books for Reference:

Mechanics by D S Mathur.

Classical Mechanics by Goldstein, Narosa.

CORE PRACTICAL

PAPER – 3 & 4

(Any 16 Experiments)

1. Youngs modulus uniform bending Pin and microscope.
2. Youngs modulus uniform bending Scale and Telescope.
4. Melde’s String – Frequency of the vibrator – Both modes.
5. Spectometer – μ of a prism – id curve.
10. Potentiometer – Calibration of high range ammeter.
12. Figure of merit of a galvanometer – Table Galvanometer.
13. m and B_H – Tan C – deflection magnetometer and vibration magnetometer.
14. BG – Figure of merit – Charge sensitiveness.
15. BG Comparison – (C_1/C_2) of capacitance.
16. BG Comparison – (E_1/E_2) emf’s of two cell.
17. Low range power pack – using two diodes.
20. IC Voltage regulator using 7805.
ALLIED – 2

PAPER – 4

MATHEMATICS – II

Objectives of the Course

To Explore the Fundamental Concepts of Mathematics

UNIT-I : Integral Calculus

Bernoulli’s formula for integration by parts - Reduction formulae
for: \( \int x^m e^{ax} \, dx \), \( \int \sin^n x \, dx \), \( \int \cos^n x \, dx \) (with proof & problems),

\( \frac{\pi}{2} \)

\( \int \sin^m x \cos^n x \, dx \) (no proof, problems only), properties of definite

\( 0 \)

integrals and simple problems.

UNIT-II: Application of Integration

Evaluation of double, triple integrals - Simple applications to area, volume - Fourier series for functions in \((0,2\pi)\) and \((-\pi, \pi)\).

UNIT-III: Partial Differential Equations

Formation, complete integrals and general integrals - Four standard types, Lagrange’s equations.

UNIT-IV : Laplace Transforms

Laplace Transformations of standard functions and simple properties - Inverse Laplace transforms - Applications to solutions of linear differential equations of order 1 and 2 - simple problems

UNIT-V: Vector Analysis

Scalar point functions - Vector point functions - Gradient, divergence, curl - Directional derivatives - Unit to normal to a surface - Line and surface integrals - Guass, Stoke’s and Green’s theorems (without proofs) - Simple problem based on these Theorems.
Recommended Text


Reference Books


Isaac, Allied Mathematics. New Gamma Publishing House, Palayamkottai
SKILL BASED SUBJECT

PAPER – 2

ELECTRONICS APPLIANCES

UNIT – I


UNIT - II

chokes – Transformers – testing of diodes, transistors and ICs – CRO – Waveforms and Lissajoue’s figures – A/F and R/F oscillators – usage of bread board.

UNIT – III


UNIT – IV

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

UNIT – V

Basic concepts of radio transmitter and receiver – Basic concepts of TV Transmitter 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:


Functional Electronics by Ramanan.

Elements of Electronics by Bagde and Singh.

Monochrome and Colour TV by Gulati.

NON MAJOR ELECTIVE

PAPER – 2

BASIC PHYSICS

UNIT – I : MECHANICS


UNIT – II : HEAT

Variation of boiling point with pressure – Pressure cooker – Refrigerator – Air Conditioner – Principle and their capacities – Bernoulli Principle – Aereo plane.

UNIT – III : SOUND AND OPTICS


UNIT – IV : GEO PHYSICS AND MEDICAL PHYSICS


UNIT – V : SPACE SCIENCE AND COMMUNICATION


Books for study:
The Learner’s Series – Everyday Science – Published by INFINITY BOOKS, New Delhi.
The Hindu speaks on Science, Vol I & II, Kasturi & Sons, Chennai.

Books for study:
SEMESTER V

PAPER – 5

OPTICS

UNIT – I : GEOMETRICAL OPTICS

Spherical aberration in 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’s and Huygen’s eyepieces – Constant deviation spectrometer – Calculation of characteristic wave number of spectral lines.

UNIT – II : INTERFERENCE


UNIT – III : DIFFRACTION


UNIT – IV : POLARIZATION

UNIT – V : FIBRE OPTICS

Introduction – Structure of optical fibre - Types of Optical Fibres – Classification based on Refractive index – Transmission characteristic of optical fibres – optical fibre communication system Application of optical fibres as wave guide and sensors – Mach – Zehnder interferometer.

Books for study:


Books for Reference:


UNIT – I : DISCHARGE PHENOMENON THROUGH GASES


UNIT – II : ATOMIC STRUCTURE


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 D₁ and D₂ lines of sodium – Paschen back effect -theory – Stark effect (qualitative treatment only).

UNIT-IV: INFRARED AND RAMAN SPECTROSCOPY

The energy of a Diatomic molecule - The simple harmonic oscillator - The Diatomic vibrating rotator - The vibration - rotation spectrum of carbon monoxide - Techniques and Instrumentation (outline).

Quantum theory of Raman effect - Molecular Polarizability - Pure rotational Raman spectra of linear molecules - Vibrational Raman spectra - Structured determination from Raman and Infrared spectroscopy - Techniques and Instrumentation (outline).
UNIT V : ELECTRONIC SPECTROSCOPY OF MOLECULES AND LASER PHYSICS


Books for study:


Atomic physics by J B Rajam.

Spectroscopy by Gupta & Kumar

Spectroscopy by Banewell

Books for Reference:


UNIT – I : SEMICONDUCTOR THEORY DEVICES AND CHARACTERISTICS


UNIT – II : RECTIFIERS AND AMPLIFIERS


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

Books for study:


Elements of electronics by Bagde and S P Singh.

Functional electronics by Ramanan.

Monochrome and Colour TV by Gulati.


Books for reference:

Electronic principles by Malvino.

Electronic devices and circuits by Allen Mottershed.

Monochrome and colour TV Gulati.

Basic Television and videosystems by B Grob.


SKILL BASED SUBJECT

PAPER – 3

ASTRO PHYSICS

UNIT – I: EARLIEST ASTRONOMY AND SPACE


UNIT – II: SPACE


UNIT – III: STARS


UNIT – IV: SOLAR SYSTEM


UNIT – V: SPACE DISTANCE, UNITS AND CO-ORDINATES

Books for study:

Hewish. A / Physics of the universe / CSIR publication, New Delhi, 1992.


Krishnasamy K.S. / Astro Physics a modern perspective / New Age International / New Delhi.


Books for reference:


SEMESTER VI
PAPER – 8
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.


UNIT – II : NUCLEAR DECAY


UNIT – III : PARTICLE ACCELERATORS AND DETECTORS


UNIT – IV : RADIATION PHYSICS

UNIT – V : ELEMENTARY PARTICLES


Books for study:

Modern physics by R Murugeshan S Chand & Co.


Atomic and nuclear physics by Littlefeld & Thorley.


Books for reference:


Nuclear Physics – Irving Keplan.

UNIT – I : RELATIVITY


UNIT – II : WAVE MECHANICS


UNIT – III : SCHRODINGER EQUATIONS AND ITS APPLICATIONS


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 $\nabla^2$ in Cartesian, spherical and cylindrical coordinates.

UNIT – V : SPECIAL FUNCTIONS

Books for study:

Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.


Quantum Mechanics by V K Thangappan, Wiley Eastern.


Mathematical Physical by Sathya Prakash.

Mechanics and Mathematical Methods by Murugeshan, S Chand Publishing & Co.

Books for reference:

Mathematical Physics by B D Gupta.

Quantum Mechanics by Ghatak and Loganathan, McMillan.

PAPER – 10

SOLIDSTATE PHYSICS

Unit - I

Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Primitive and Unit cell – Number of lattice points per unit cell - Seven Classes of Crystals - Bravais lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal - Diamond Structure – Atomic Packing – Atomic radius —Lattice constant and density- Crystal structure (sc; hcp; fcc;bcc.)

Unit - II


Unit - III


Unit - IV


Unit - V

Books for Study:

1. Solid State Physics Gupta and Kumar

2. Modern Physics R Murugesan


4. Material Science and Engineering by V. Raghavan, PHI

5. Introduction to Solids by Azaroff, TMH.


Books for Reference:


2. Solid State Physics A J Dekker
CORE PRACTICAL – III

PAPER – 5 & 6

(Any 20 Experiments)

1. Bifilar Pendulum – Parallel Threads – Verification of Two Theorems.
2. Youngs modulus – Koenig’s method - non uniform bending.
4. Newton’s rings – R₁, R₂ and – μ of material a convex lines.
5. Searle’s viscometer – ‘η’ for High Viscous Liquid.
8. Dispersive power of a prism.
9. Dispersive power of a grating.
10. Spectrometer – Cauchy’s constants.
11. Laser beam – diffraction at a straight wire – determination of thickness of the wire.
12. Field along the axis of circular coil – deflection magnetometer – M and B_H – Null Method.
13. Field along the axis of circular coil – Vibrating magnetic needle - B_H.
17. Potentiometer – Conversion of galvanometer into voltmeter.
18. Potentiometer – Conversion of galvanometer into ammeter.
19. BG – absolute capacitance of a capacitor.
20. BG – comparison mutual inductances.
21. BG – High resistance by leakage.
22. BG – internal resistance of a cell.
24. Colpitt’s oscillator.
25. RC Coupled single stage amplifier (without feedback).
CORE PRACTICAL – IV

ELECTRONICS

1. FET – Characteristics.
2. UJT – Characteristics.
3. UJT – Relaxation oscillators.
5. NAND, NOR as universal gates.
6. Verification of De Morgan’s Theorems.
7. Transistor – Phase shift oscillator.
8. Transistor – Wein bridge oscillator.
9. Emitter Follower.
10. OP – Amp – Voltage follower, adder, subtractor, average (inverting mode).
11. OP – Amp – Inverting amplifier with frequency gain response.
12. Half adder and Full adder – using NAND gate only.
13. Half subtractor and Full subtractor – using NAND gate only.
14. RS, Clocked RS, and D Flip Flops using NAND gate only.
15. Four bit ripple counter – 7473 / 7476.
18. Number conversion – 8 bit – BCD to binary, Binary to BCD, Hex to ASCII using 8085.
20. Micro processor – Sum of N elements
SKILLED BASED SUBJECT

PAPER – 4

INSTRUMENTATION TECHNIQUES

UNIT – I : ELECTRICAL INSTRUMENTATION


UNIT – II : ELECTRONIC INSTRUMENTATION


UNIT – III : ANALYTICAL INSTRUMENTATION


UNIT – IV : BIO-MEDICAL INSTRUMENTATION


Books for study:

Arumugam M / Biomedical instrumentation / Anuradha Publications, Kumbakonam / 2011.


ELECTIVE SUBJECTS

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

**GROUP A**

- Elective 1: Digital Electronics
- Elective 2: Applied Electronics
- Elective 3: Microprocessor and its Applications – 8085

**GROUP B**

- Elective 1: Materials Science
- Elective 2: Applied Electronics
- Elective 3: Laser and Fibre Optic Communication

**GROUP B**

- Elective 1: Fundamentals of Nano Materials and its Characterization
- Elective 2: Applied Electronics
- Elective 3: Medical Physics
ELECTIVE

GROUP A

PAPER – 1

DIGITAL ELECTRONICS

UNIT – I: DIGITAL FUNDAMENTALS AND LOGIC GATES

Number systems – decimal, binary, octal and hexadecimal system – 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 multiplications and division -

AND, OR circuits using diodes and transistors – NOT using transistors – NAND, NOR and EXOR – functions and truth tables. NAND & NOR as universal gates.

UNIT – II: BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC CIRCUITS


UNIT – III: DATA PROCESSING CIRCUITS AND SEQUENTIAL LOGICS


UNIT – IV: SHIFT REGISTERS AND COUNTERS

UNIT – V : D/A AND A/D CONVERTERS


Books for study:


Books for Reference:

Computer architecture and logic design by T C Bartee, McGraw Hill, 1991.2.

Solid state electronics by 1 Agarwal and Anit Agarwal.

Digital integrated electronics by Herbert Taub and Donald Schilling, McGraw Hill.


PAPER – 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.

UNIT – II: OPERATIONAL AMPLIFIER AND APPLICATIONS


OPAMP – Sign and Scale changer – adder, subtractor and averager – Integrator and differentiator – DC voltage follower – ac voltage follower –

UNIT – III: OTHER APPLICATION OF OPAMP


UNIT – IV: 555 TIMER AND PLL


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:

Basic and Applied Electronics by M. Arul Thalapathi – Comtec Publisher Chennai – 2005.


Linear Integrated Circuits by D. Roy Choudhury and Shail Jain – New age international (P) Ltd.


Books for Reference:


UNIT – I : MICROPROCESSOR ARCHITECTURE AND ITS OPERATIONS


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.

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

Counters – time delay using one and pair of registers – Instruction timings of 8085 – T-states – delay routines and delay calculations.

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.

UNIT – V : INTERFACING DATA CONVERTERS AND PERIPHERAL DEVICES

Books for study:

Microprocessor Architecture, Programming and Applications with the 8085 – R.S. Goankar, 3rd Edn. Prentice Hall.


Books for reference:


Fundamental of Microprocessor and Microcomputers – B. Ram.


ELECTIVE

GROUP B

PAPER – 1

A. MATERIALS SCIENCE

UNIT – I : MATERIAL SCIENCE


UNIT – II : PHASE DIAGRAM AND TRANSFORMATION


UNIT – III : VACUUM AND OXIDATION


UNIT – IV : NON-DESTRUCTIVE TESTING (NDT)


UNIT – V : ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

Books for study:


Books for reference:


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.

UNIT – II : OPERATIONAL AMPLIFIER AND APPLICATIONS


OPAMP – Sign and Scale changer – adder, subtractor and averager – Integrator and differentiator – DC voltage follower – ac voltage follower –

UNIT – III : OTHER APPLICATION OF OPAMP


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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:

Basic and Applied Electronics by M. Arul Thalapathi – Comtec Publisher Chennai – 2005.


Linear Integrated Circuits by D. Roy Choudhury and Shail Jain – New age international (P) Ltd.


Books for Reference:


PAPER – 3

LASER AND FIBRE OPTIC COMMUNICATION

UNIT – I: LASER PHYSICS


UNIT – II: TYPES OF LASERS AND OUTPUT MODULATION METHODS


UNIT – III: APPLICATIONS OF LASER


UNIT – IV: OPTIC FIBERS


UNIT – V: FIBER OPTIC COMMUNICATION

Books for study:


Fiber-Optic Communication Systems, Govind P. Agarwal, John-Willey & Sons,

Books for Reference:


ELECTIVE

GROUP C

PAPER – 1

FUNDAMENTALS OF NANO MATERIALS AND ITS CHARACTERIZATION

UNIT – I : INTRODUCTION TO NANOTECHNOLOGY

Definition of Nanoscale system – Feymann theory of Nanotechnology – types of nanotechnology – Molecular Nanotechnology – Molecularr and atomic size – Surface and dimensional space – opportunities at the Nanoscale.

Unit – 2: NANO PROPERTIES

Forces between atoms and molecules, particles and grain boundaries – Vander Waals and electrostatic forces between surface – Nano and Mesopores – size dependent variation in magnetic, electronic transport, resistivity, optical and etc – Misnomers and misconception of Nanotechnology.

Unit – 3 : QUANTUM CONFINEMENT


Unit – 4: SYNTHESIS OF NANOMATERIALS AND ITS CHARACTERIZATION


Unit – 5: APPLICATION OF NANOMATERIALS

Books for Study & REFERENCE:


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.

UNIT – II : OPERATIONAL AMPLIFIER AND APPLICATIONS


OPAMP – Sign and Scale changer – adder, subtractor and averager – Integrator and differentiator – DC voltage follower – ac voltage follower –

UNIT – III : OTHER APPLICATION OF OPAMP


UNIT – IV : 555 TIMER AND PLL


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:

Basic and Applied Electronics by M. Arul Thalapathi – Comtec Publisher Chennai – 2005.


Linear Integrated Circuits by D. Roy Choudhury and Shail Jain – New age international (P) Ltd.


Books for Reference:


PAPER – 3

MEDICAL PHYSICS

UNIT – I: X – RAYS


UNIT – II : RADIATION PHYSICS


UNIT – III : MEDICAL IMAGING PHYSICS


UNIT – IV : RADIATION THERAPY PHYSICS


UNIT – V : RADIATION PROTECTION

Book for Study:


2. Christensen’s Physics of Diagnostic Radiology : Curry, Dowdey and Murrey – Lippincot Williams and Wilkins (1990)


Books for Refernece :

1. Nuclear medicine Physics : Chandra – Lippincot Williams and Wilkins (1998)

2. The Physics of radiology : John R. Gunningham and Johns – Charles C Thomas USA (19190)


5. Erric Hall Radio Biology for the Radiologist – Lippincott Williams & Wilkins.


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