**B.Sc. PHYSICS**

**I YEAR – I SEMESTER**

**COURSE CODE: 7BPHA1**

**ALLIED COURSE I – PROPERTIES OF MATTER, THERMAL PHYSICS AND OPTICS (THEORY)**

**Unit I PROPERTIES OF MATTER**

Young’s modulus – Rigidity modulus – Bulk modulus – Poisson’s ratio (definition alone) – Bending of beams – Expression for bending moment – determination of young’s modulus – uniform and non-uniform bending.

Expression for Couple per unit twist – work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by torsion pendulum.

**Unit II VISCOSITY**

Viscosity – Viscous force – Co-efficient of viscosity – units and dimensions – Poiseuilles formula for co-efficient of viscosity of a liquid – determination of co-efficient of viscosity using burette and comparison of Viscosities - Bernoulli’s theorem – Statement and proof – Venturimeter – Pitot tube.

**Unit III CONDUCTION, CONVECTION AND RADIATION**

Specific heat capacity of solids and liquids – Dulong and Petit’s law – Newton’s law of cooling – Specific heat capacity of a liquid by cooling – thermal conduction –coefficient of thermal conductivity by Lee’s disc method.

Convention process – Lapse rate – green house effect – Black body radiation – Planck’s radiation law – Rayleigh Jean’s law, Wien’s displacement law – Stefan’s law of radiation. (No derivations)

**Unit IV THERMODYNAMICS**

Zeroth and I Law of thermodynamics – II law of thermodynamics – Carnot’s engine and Carnot’s cycle – Efficiency of a Carnot’s engine – Entropy – Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.

**Unit V OPTICS**

Interference – conditions for interference maxima and minima – Air wedge – thickness of a thin wire – Newton’s rings – determination of wavelength using Newton’s rings.

Diffraction – Difference between diffraction and interference – Theory of transmission grating – normal incidence – optical activity – Biot’s laws – Specific rotatory power – determination of specific rotatory power using Laurent’s half shade polarimeter.

**Text Books:**

1. Properties of matter – Brijlal and Subramanyam – Eurasia Publishing co., New Delhi, III Edition 1983
2. Element of properties of matter – D.S.Mathur – S.Chand & Company Ltd, New Delhi, 10th Edition 1976
3. Heat and Thermodynamics–Brijlal& Subramanyam, S.Chand & Co, 16th Edition 2005
4. Heat and Thermodynamics – D.S. Mathur, SultanChand & Sons, 5th Edition 2014.
5. Optics and Spectroscopy –R.Murugeshan, S.Chand and co., New Delhi, 6th Edition 2008.
6. A text book of Optics – Subramanyam and Brijlal, S. Chand and co.. New Delhi, 22nd Edition 2004.
7. Optics – Sathyaprakash, Ratan Prakashan Mandhir, New Delhi, VIIth Edition 1990.

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**I YEAR - I /II SEMESTER**

**COURSE CODE: 7BPHAP1**

**ALLIED GENERAL PHYSICS PRACTICALS**

(University examination will be held at the end of Second/ Fourth Semester)

**ANY FIFTEEN EXPERIMENTS**

1. Young’s modulus – Uniform bending (Optic lever)
2. Young’s modulus – Non Uniform bending (Optic lever)
3. Young’s modulus – Uniform bending (Pin and Microscope)
4. Young’s modulus – Non uniform bending (Pin and Microscope)
5. Torsion Pendulum – Rigidity modulus of a wire
6. Torsion pendulum – Moment of inertia of a circular disc
7. Comparison of viscosities of liquids using a burette.
8. Newton’s law of cooling.
9. Coefficient of thermal conductivity – Lee’s disc method
10. Newton’s rings – Radius of curvature of a lens
11. Thickness of a thin wire by air wedge
12. Grating – Normal incidence method
13. Calibration of Voltmeter – Potentiometer
14. Calibration of Ammeter – Potentiometer
15. Comparison of resistances - Potentiometer
16. Carey – Foster Bridge – temperature co-efficient of resistance
17. LCR – series resonance circuit
18. LCR – parallel resonance circuit
19. Zener diode as a voltage regulator
20. Transistor Characteristics – CE
21. Bridge rectifier
22. Logic circuits using discrete components
23. Logic circuits using IC
24. NAND & NOR as universal gates

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**I YEAR – II SEMESTER**

**COURSE CODE: 7BPHA2**

ALLIED COURSE II – ELECTRICITY, ELECTRONICS, ATOMIC AND NUCLEAR PHYSICS (THEORY)

**Unit I CURRENT ELECTRICITY**

Ohm’s law – Law of resistance in series and parallel – Specific resistance – capacitors – capacitors in serial and parallel – Kirchoff’s laws – Wheatstone’s network – condition for balance.

Carey-Foster’s bridge – measurement of resistance – measurement of specific resistance –determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter.

**Unit II ELECTROMAGNETISM**

Electromagnetic Induction – Faraday’s laws – Lenz law – Self Inductance – Mutual Inductance – Coefficient of Coupling.

A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

**Unit III ATOMIC AND NUCLEAR PHYSICS**

Bohr’s atom model – radius energy – Atomic excitation – Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy.

Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission – X-rays – Production – properties –Derivation of Bragg’s law – uses in industrial and medical fields.

**Unit IV ANALOG ELECTRONICS**

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply.

Transistor – Working of a transistor – CE Configuration – current gain relationship between α and β – Transistor Characteristics – CE Configuration only – CE amplifier – feedback – Hartley oscillator – Colpitt’s oscillator.

**Unit V DIGITAL ELECTRONICS**

Number system – Decimal – Binary – Octal and Hexadecimal system – Double Dabble method – Binary addition, subtraction and multiplication – conversion of one number system to another number system.

Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder – Laws and theorems of Boolean’s algebra – De Morgan’s theorems.

**Books for Study and Reference:**

1. Electricity and Magnetism – R. Murugesan, S. chand & co, 2001.
2. Modern Physics – R. Murugesan, S. chand & co, 1998.
3. Basic Electronics – B.L. Theraja, S. chand & co, 2003.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7BPHA3**

**ALLIED COURSE III – BASIC DISCRETE ELECTRONICS AND APPLICATIONS OF ELECTRONIC DEVICES (THEORY)**

**Unit I DC AND AC FUNDAMENTALS**

Direct voltages and current – Kirchoffs laws – alternating voltages and current – RMS value of Voltage and current – Power, frequency, time period, phase difference, average value, peak to peak value of ac.

Passive circuit elements**:** Resistors, inductors and capacitors – types and colour codes – AF and RF chokes.

**Unit II SEMICONDUCTORS**

Diodes: PN junction diode characteristics – Half wave, full wave and bridge rectifiers with filters – Inductor, Capacitor and π-section filters (principle only) – Different diodes – Zener, light emitting diode, photo diode.

Transistors:Transistor – working – characteristics of a transistor – CE configuration– Loadline – quiescent point – JFET static characteristics pinch – off voltage.

**Unit III POWER ELECTRONICS**

Principle, Construction, operation and characteristics of SCR, UJT, DIAC and TRIAC.

Application of SCR as controlled rectifier – UJT relaxation oscillator – DIAC and TRIAC controller circuits.

**Unit IV MEASURING INSTRUMENTS**

Galvanometer – conversion of galvanometer into ammeter and voltmeter – Multimeter – construction and operation– CRO block diagram representation – basic operation – voltage and phase measurement – Display and analysis.

**Recorders and Bio Medical Recorders:** X-Y recorder – Magnetic tape recorder – characteristics of recording system – Need for recorder – Electro-cardiography (ECG) – Electro-encephalography (EEG) – Electro-myography (EMG) – Electro-retinography (ERG).

**Unit V HOME APPLIANCES**

Electric fans – construction and operation – Refrigerators – principle and operation – Tape recorder– principle and working.

Air conditioner and Air Coolers – principle and working – Washing machines – different types – general principle and working.

**Text Books:**

1. Basic Electronics (Solid State) – B.L. Theraja – S.Chand & Co., New Delhi.
2. Principles of Electronics – V.K. Mehta & Rohit Mehta – S.Chand & Co., New Delhi.
3. Electronic Devices and Circuits – S. Salivahanan, Sureshkumar & A. Vallavaraj – TMH Pub.Company Ltd., New Delhi
4. Bio-medical Instrumentation – Dr. M. Arumugam Anuradha Publication, Kumbakonam
5. How things work? Vol.I & Vol. II
6. Electronic instruments and measurement techniques – William D. Cooper – PHI Pvt Co., New Delhi.

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**II YEAR – III/IV SEMESTER**

COURSE CODE: 7BPHAP2

ALLIED ELECTRONICS PRACTICALS

ANY FIFTEEN EXPERIMENTS

1. Measurement of R, C and L using multimeters
2. Measurement of R, C and L using VTVM
3. Measurement of voltage, current, frequency and phase using CRO
4. Half & Full wave rectifier – construction of measurement
5. UJT characteristics
6. UJT relaxation oscillator
7. SCR characteristics
8. Loadline analysis of transistor amplifier.
9. Thermistor characteristics
10. LED characteristics
11. Photo diode characteristics
12. 7 segment display characteristics
13. Study of logic gates using ICs (AND, OR, NOT, NAND, NOR, EX-OR etc)
14. OPAMP circuits – low pass and high pass filters
15. Full Adder – Binary Addition
16. Three terminal IC voltage regulator
17. 8085 microprocessor – simple programs
18. Amplitude Modulation
19. Preparation of PCB

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**II YEAR – IV SEMESTER**

**COURSECODE: 7BPHA4**

**ALLIED COURSE IV – ICS, SIMPLE CONTROL SYSTEMS AND COMMUNICATION ELECTRONICS (THEORY)**

**Unit I INTEGRATED CIRCUITS**

Integrated Circuits: Classification – IC Chip size and circuit complexity – Fundamentals of Monolithic IC technology – Fabrication of Diode, Transistor, FET, Resistor, Inductor and Capacitor – IC Package and symbols.

Analog ICs: op-amp characteristics and simple applications. Digital IC’s – basic logic gates – truth table – Boolean algebra and DeMorgan’s theorem.

**Unit II TRANSDUCERS**

Photo voltaic cells – photo conductive cells – photo emissive cells – loud speakers – electro dynamic and electrostatic types – carbon, dynamic and crystal microphones – applications – thyratron - applications.

Thermostat – temperature control – liquid level indicators – measurement of pressure using resistance Strain Gauges – Transducers – inductive capacitive and resistive types.

**Unit III SIMPLE CONTROL SYSTEMS**

Fundamentals of servo mechanisms – DC servomotor – AC servomotor – tacho generator – synchro power amplifier – stepper motor – stepper motor control – P,I,D,PI,PD and PID controllers.

#### Unit IV TELEVISION

General principles of image transmission – reception of signals – pick up instruments – image scanning sequence – composite video signal – resolution and bandwidth.

Television transmitter – television receiver – characteristics of monochrome television system – simplified colour channel of a TV transmitter – colour TV receiver.

**Unit V RADAR**

Principle of Radar – basic arrangement of radar system – operating characteristics of radar systems– maximum range of a radar set – radar transmitting systems – radar antennas – duplexer – radar receivers – indicator unit – description of radar systems.

**Text Books:**

1. Integrated Electronics – Jacob Millman & C. C. Halkias (Tata McGraw Hill).

2. Basic Electronics, 6th Edition by B. Grob, McGraw-Hill, NY, 1989.

3. Industrial electronics – G.K.Mithal

4. Handbook of electronics – Gupta and Kumar

5. Monochrome and colour televison – Gulati

**Books for Reference:**

1. Electronic Communication Systems, Kennedy, McGraw Hill Inter Student Edition.

2. Digital and Analog Communication System, Sam K. Shanmugam, John Willey.

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