

Syllabus for B. Sc. VI Semester
Optional Physics
PHY 602: Paper -6.2 Material Science & Electronics-II
Total hours of teaching : 42 hrs

- 1. Materials Science** **4 hrs**
Scope of Materials science, engineering classification of materials, engineering requirement of materials, crystalline and non-crystalline states of materials.
- 2. Bonding in materials** **4 hrs**
Covalent bonding, ionic bonding and metallic bonding. Give examples and discuss covalent solids, ionic solids and metallic solids.
- 3. Mechanical properties of materials** **4 hrs**
Strength, elasticity and hardness (give examples and compare properties of different materials), fatigue, creep and fracture.
- 4. Electrical and thermal properties of materials** **4 hrs**
Conductivity of metals, semiconductors and superconductors. Dielectric properties of insulators (dielectric properties), thermal conductivity and thermal expansion
- 5. Thin films** **3 hrs**
Definition, methods of preparation: physical and chemical, thermal evaporation in vacuum (describe experiment), Sputtering Technique applications of thin films.
- 6. Nanophysics & nanomaterials:** **4 hrs**
Nanoscale systems, size effect, correlation with quantum mechanical particle in a box, quantum structures, quantum wells. Synthesis of nano materials, characterization and applications (qualitative).
- 7. Oscillators:** **6 hrs**
Concept of Feedback Positive , negative feedback Sinusoidal oscillators: Tuned oscillators-Barkhausen criterion for oscillations, Hartly and Colpitt's oscillators. RC oscillators – Phase shift oscillator and Wien Bridge oscillator. Non- sinusoidal oscillators: Astable, Monostable and Bi- stable multivibrators.
- 8. Digital Electronics:** **6 hrs**
Number systems: Decimal, Binary, Hexadecimal and their inter –conversion. Boolean algebra, K- maps, basic theorems, Logic gates; OR, AND, NOT, NAND and XOR gates. Half adder, full adder and adder. Flif flops; RS, D, JK and M/S filp flops, counters – Serial and Parallel counters, modified counter, shift register, ring counter, shift counter and mod – 16 counter.
- 9. Radio Communication:** **7 hrs**
Radio – wave propagation, need for modulation, Amplitude modulation, modulation factor, side band. band width, power in AM wave, Frequency modulation, de-modulation, super-hetrodynes. Block diagrams of AM & FM receivers. Selectivity, sensitivity, dynamic range, image frequency and image rejection(Qualitative).

Reference books

1. Materials Science and processes by S.K.Hajra Choudhury
2. Materials Science by Raghavan V
3. Material Science, M.Arunugam, Anuradha agencies, Kumbakonam (2002)
3. Applied electronics by R.S. Sedha
4. Operational Amplifiers and linear integrated Circuits by Ramakanth Gayakawad
5. Digital Principles and Applications by Malvino and Leach.
6. Digital Electronics by Gathmann
7. Electronics Communication by Sanjeev Gupta.
8. Integrated Circuits by K R Botkar, Khanna Publilshers.
9. Introduction to Solid State physics by C Kittel.
10. Solid State Physics by A J Dekkar.
11. Introduction to Solid State Physics by J S Blackmore.

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PHYL6.2: Practical course for Semester VI

Instructions

1. Two experiments (3 hours duration each) per week should be performed.
2. One practical internal test of 3 hours duration for 15 marks be conducted at the end of practical course in the semester.
3. Minimum of 6 experiments should be performed in semester VI.

List of experiments

1. Determination of capacitance of capacitor using Maxwell's bridge.
2. Colpitt's oscillator using transistor.
3. Construction of OR, AND, NOT, NOR & NAND gates using diodes/transistor/IC and verification of their truth tables.

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4. Verification of de Morgan's theorem. (using ICs)
5. Verification of truth table of half adder and full adder. (using ICs)
6. Absorption coefficient of aluminum for β - rays.
7. Attenuation coefficient of γ - rays.
8. Construction and verification of RS and JK flip- flops.
9. Study Op-Amp characteristics: Determine Offset voltage and CMMR
10. Operational Amplifier: voltage to current and current to voltage converter
11. Operational Amplifiers – Inverting and Non- inverting.
12. Measurement of resistance of thin films by four- probe method.
13. Interplanar Spacing – X-ray diffraction.
14. Mapping of HR diagram.
15. Estimation of Chlorophyll in plant cel