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**Department of Applied Physics**

**Delhi Technological University**

**Bawana Road, Delhi-110 042**

**AP-102-Physics–II (2020)**

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| **Unit** | **Detailed topics of the syllabus** **to be covered after mid semester examination** |
| 2. | **Classical Statistics:**   * Introduction to statistical mechanics, Microscopic and macroscopic systems * Concept of phase space * Basic postulates of statistical mechanics (only statements) * Basic idea about distinguishable & non-distinguishable particles, possible microstates with one example * Maxwell – Boltzmann’s distribution law (Derivation not required) * Example/ Application of MB statistics: Molecules of an ideal gas-  1. Distribution of energies for the molecules of an ideal gas and its derivation 2. Average energy and most probable energy and their derivations 3. Distribution of speeds for the molecules of an ideal gas (Derivation not required) 4. Average speed, most probable speed and rms speed and their derivations |
| 3. | **Quantum Statistics:**   * Introduction to quantum statistical mechanics * Symmetric and Anti-symmetric wave functions * A general Comparison of the three statistics MB, BE and FD. * Bose – Einstein statistics and its distribution function (Derivation not required) * Example/ Application of MB statistics: Photon gas: Planck radiation law * Fermi – Dirac statistics and its distribution function (Derivation not required) * Example/ Application of FD statistics: Free electrons in a metal  1. Concept of Fermi energy, definition 2. Electron energy distribution and its derivation 3. Derivation of expression for Fermi energy (in terms of N/V, h and m) 4. Average electron energy at absolute zero |
| 4. | **Nuclear Physics:**   * Constituent of the nucleus, Properties of nucleus i.e. nuclear size, nuclear density and nuclear force * Binding energy, Binding energy versus mass number curve, Stability of nuclei * Nuclear Models: Liquid drop model and derivation of semi-empirical mass formula, Shell model * Radioactivity, Decay law (alpha and beta decay), Basic difference between alpha and beta spectrum, relation for energy of alpha particles, , * Nuclear reactions, Q value of nuclear reactions. * Nuclear fission  1. Spontaneous and induced fission, 2. Energy released in fission 3. Mass distribution 4. Elementary ideas of nuclear reactors, chain reaction  * Nuclear fission:  1. Thermonuclear Fusion 2. Thermonuclear Fusion in stars: p-p cycle and carbon cycle 3. Controlled thermonuclear Fusion (Fusion reactor) |
| 6. | **Semiconductor Physics:**   * Intrinsic semiconductors: (i) Definition, (ii) examples and (iii) concept of Fermi level and its position in Intrinsic semiconductors, Derivation of carrier concentration of electrons and holes,(iv) (iv) derivation for ni2 = no.po (product of no and po is always a constant for a given semiconductor at a given temp) (v) Variation of carrier concentration and conductivity with temperature, determination of band gap * Extrinsic semiconductors: (P and N type of semiconductors) (i) Definition, (ii) examples, (iii) position of Fermi level and its variation with temperature (Qualitative explanation only) * Drift and diffusion current, Einstein Relation * Hall effect- Definition, Hall voltage, Hall coefficient |

**Text Books**

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| **S.No.** | **Name of Books/Authors** | **Year of Publication/ Reprint** |
| 1. | Perspective of Modern Physics, by Arthur Beiser | McGraw-Hill US, 1969 |
| 2. | Statistical Mechanics by R.K. Pathria | Butterworth-Heinemann (Elsevier), 1996 |
| 3. | Materials Science and Engineering” by V. Raghavan, | PHI Learning Private limited, 2009. |
| 4. | Solid state electronic devices by Streetman and Banerjee | Prentice Hall, 2000 |
| 5. | Semicondutors physics & Devices by D. A. Neaman | 4th edition, McGraw-Hill US, 2015 |