SEMESTER – III			
Core VI INORGANIC CHEMISTRY - II			
Code : 17PCHC31	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 5**

Unit I Solid state I

Electronic structure of solids - band theory, free electron theory, Insulators and semiconductors and its types. Electrical properties (Thomson effect, Peltier effect, Seeback effect, Hall effect) - Dielectric, Ferroelectric, Piezoelectric and Pyrroelectric materials and their and applications. Optical and magnetic properties of semiconductors, p - n junction and n-p-n junction and their applications. Solid electrolytes, superconductors, High-temperature superconductors, BCS theory, cooper electrons Meissner effect and levitation.

Unit II Solid state II

Types of close packing - hcp and ccp, packing efficiency, radius ratios - Powder x-ray diffraction - electron and neutron diffraction – Solid state reactions - Methods of Single crystal growth- Bridgeman, Czochralski, Verneuil - Chemical vapour transport - Hydrothermal method - Dislocations in solids - Point defects - Schottky and Frenkel defects - Line defects - Surface Defects – Dislocations - Grain Boundary and Stacking Fault - Crystal structures of common ionic compounds NaCl, Na_2O, zinc blende, wurtzite, nickel arsenide, CsCl, rutile, CdI_2, $CdCl_2$, and Cs_2O, perovskite, K_2NiF_4, spinels.

Unit III Nuclear Chemistry

Radioactive decay and equilibrium - Nuclear Reactions - Types, Q value, Cross Section of reactions, Chemical effects of nuclear transformation - Nuclear Fission - theory of nuclear fission, Fission Products, Fission Yield - Nuclear Fusion and stellar energy - Nuclear Reactors - Nuclear waste management - Nuclear reactors in India – Radioactive techniques: i) Countering Techniques such as G.M Ionization and Proportional counters. ii) Tracer techniques (Neutron activation analysis).

Unit IV Spectroscopy II

Electronic spectroscopy - Microstates, Term symbols, selection rules - Orgel and Tanabe sugano diagrams - charge transfer spectra - electronic spectra of complexes (transition and inner transition complexes) - Calculation of Dq, B, Nephelauxetic ratio.

Photo electron spectroscopy – UVPES - Principle, spin-orbit coupling – XPES - Principle, spin- spin splitting , chemical shift in XPES - Koopman's theorem - Applications of XPES and UVPES to inorganic spectra - Auger electron spectroscopy.

Unit V Spectroscopy III

NMR - Principle, ^{31}P, ^{19}F and ^{15}N NMR - Applications of spin-spin coupling to structure determination - Nuclei with quadrupole moment - Double resonance - NMR of fluxional molecules - Applications in biological systems.

NQR – Principle - Energies of the quadrupole transitions - Structural information from NQR spectra.

EPR – Principle - Interaction between nuclear spin and electron spin (hyperfine coupling) - Hyperfine splitting in isotropic systems - Zero field splitting - Kramer's degeneracy - Anisotropy in the g value - Interpretation of g values - Anisotropy in hyperfine coupling - Applications to transition metal complexes - Jahn - Teller distortion.

References

1. West A.R., Solid State Chemistry and its Applications, John Wiley & Sons (Asia), 1998.
2. Azaroff L.V., introduction to solids, Tata McGraw Hill publishing Ltd.
3. Kittel C., Introduction to solid state physics, Wiley Eastern Ltd, 5th Edn.
4. Samuel Glasstone, Source Book of Atomic Energy, East West Pvt.Ltd., 1969.
5. Arnikar H.J, Essentials of Nuclear Chemistry, Wiley Eastern Ltd., 4th Edition, 2000.
6. Lee J.D., Concise Inorganic Chemistry, Blackwell Science Ltd., 5th Edition, Reprint, 2003.
7. Drago R.S., Physical Methods in Inorganic Chemistry ,W.B.Saunders, 1977.
8. Ebsworth David E.A.V., Rankin Stephen Credock W.H., Structural Methods in Inorganic Chemistry ,ELBS , IV 1988

SEMESTER – III			
Core VII PHYSICAL CHEMISTRY - III			
Code : 17PCHC32	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 5**

Unit I Chemical Kinetics

Theories of reaction rates - Arrhenius theory - Hard-sphere collision theory of gas phase reactions - Potential energy surfaces - Activated complex theory for ideal gas reactions (formation in terms of partition functions) - Relation between activated complex theory and hardsphere collision theory - Thermodynamic formulation - Activated complex theory (Enthalpies and entropies of activation) - Unimolecular reactions - Lindemann, Hinshelwood, RRK, RRKM and Slater theories - Kinetic isotopic effect.

Unit II Statistical Thermodynamics

Quantum statistics – Maxwell-Boltzmann statistics - Thermodynamic probability - Thermodynamic probabilities of systems in equilibrium - Boltzrnann expression for entropy – Stirling's approximation - States of maximum thermodynamics probability - Legrangian multipliers - Thermodynamic probabilities of systems involving energy levels – Maxwell-Boltzmann distribution law - Evaluation of alpha and beta in MB distribution law.

Unit III Applications of Statistical Thermodynamics

Partition function - Definition, justification of nomenclature, microcanonical and canonical ensembles - Molecular partition function and canonical function - The relation between the total partition function of a molecule and the separate partition functions - Translational partition function, rotational partition function - Effect of molecular symmetry on rotational partition function - Ortho and para hydrogen - Vibrational partition function - Electronic partition function - Evaluation of thermodynamic properties E, H, S, A, G, Cv and Cp from monoatomic and diatomic ideal gas molecule partition functions.

Unit IV Electronic Spectroscopy

Electronic spectroscopy of diatomic molecules - Born-Oppenheimer approximation - Sequences and progressions - Vibrational course structure and rotational fine structure of electronic band – The Frank-Condon principle - Dissociation energy and dissociation products - Birje-Sponer extrapolation - The fortrat diagram – Predissociation.

Photoelectron spectroscopy – Principle - Basic idea - X-ray and UVPES - ESCA - Applications of Auger electron spectroscopy.

Unit V NMR and ESR

Nuclear Magnetic Resonance Spectroscopy - Theory of PMR spectra - Chemical shift - Factors affecting chemical shift - Relaxation times and spin-spin interactions - NMR of simple AX and AMX type molecules - Calculation of coupling constants - C^{13}, P^{31} NMR, 2D-NMR spectra - Principle and applications.

Electron Spin Resonance Spectroscopy - Basic principles - Factors affecting "g" value - Hyperfine splitting - Deuterium, methyl, benzene, naphthalene, anthracene, xylene (o,m,p-), p-benzosemiquinone radicals - Calculation of electron density - McConnel equation - Fine structure in ESR - Zero field shifting and Kramer`s degeneracy - Double resonance – ELDOR and ENDOR - Study of unstable paramagnetic species - Spin labeling studies of bio-molecules.

References

1. Gurdeep Raj, Chemical Kinetics, Goel Publishing House.
2. FrostA.A and Pearson.R.G, Kinetics and Mechanism, Wiley Eastern, Pvt. Ltd.
3. Laidler.K.J, Chemical Kinetics, Third edition, New Delhi TATA McGraw Hill Co. (1984).
4. Kuriacose and Rajaram, Kinetics and Mechanism of Chemical Transformation, Macmillan & Co, Delhi (1993).
5. Lee.J.F, Sears.F.W and Turcottee.D.L, Statistical Thermodynamics (1972)
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7. Donald McQuarrie, Stastistical Thermodynamics, Indian Edition, Viva Books Private Ltd., New Delhi (2003).
8. Ferrell L Hill, Introduction to Statistical Thermodynamics, Addison-Wesley Publishing Company, INC, London (1962).
9. Kuriakose J C and Rajaram J C, Thermodynamics, Jalandar Shoban LalCo., (1996).
10. B. P. Straughan and S. Walker - Spectroscopy (vol. I).
11. Banwell C N, Molecular spectroscopy, New Delhi, TATA McGraw HillCo. (1997).
12. Drago R S, Physical Methods in Inorganic Chemistry, New Delhi, East West Press Ltd, (1971).
13. Chang R, Basic Principles of Spectroscopy, New Jersy, Englewood Cliffs(1978).
14. Straughan B P and Walker S, Spectroscopy Volume 1,2,3, New York, London Chapman and Hall, A Halstet Press Book, John Wiley & Sons Ins. (1975).
15. Barrow G M, Introduction to Molecular Spectroscopy, Tata McGraw Hill Edition (1993).
16. Gurdeep R Chatwal and Sham K Anand, Spectroscopy, Himalaya Publishing House (2009).
17. R. M. Silvertein and G. C. Basseler - Spectroscopic identification of organic compounds.

SEMESTER – IV			
Core VIII Inorganic Chemistry - III			
Code : 17PCHC41	**Hrs / Week : 6**	**Hrs / Sem : 90**	**Credits : 4**

Unit I Inorganic photochemistry

Laws of photochemistry - Photo physical processes - Prompt and delayed reactions - d-d and charge-transfer reactions - bimolecular deactivation and energy transfer - Transitions in metal-metal bonded systems - Photo substitution - Photo aquation - Photo anation - Adamson's rules - Photo rearrangement - Photo redox reations - Photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes - Photochemistry of ruthenium polypyridyls - Photochemistry of organometallic compounds - Applications in semiconductor electrodes.

Unit II Bioinorganic Chemistry I

Metalloenzymes - Role of zinc - Zinc enzymes (Carboxypeptidase A, Carbonic anhydrase, alcohol dehydrogenase) - Xanthine oxidase, aldehyde oxidase, Acid phosphatases - Enzymes dealing with H_2O_2 and O_2 - Catalases, Peroxidases, Oxidases, Oxygenases (cytochrome P_{450}) , Superoxide dismutase(Cu) –Chlorophyll and Vitamin B_{12} - Structure and mechanisms of action - Chelation therapy - Applications of complexes of Pt and Au in medicine.

Unit III Bioinorganic Chemistry II

Molecular mechanism of ion transport across membranes (Na and K ions) - Ionophores - Transport and storage of iron - Siderophores, Transferrin, Ferritin – Porphyrins - O_2 binding properties of heme (haemoglobin and myoglobin) and non-heme proteins (hemocyanin & hemerythrin) - their coordination geometry and electronic structure, co-operativity effect, Hill coefficient and Bohr effect - Electron transfer proteins - structure and functions of ferredoxin, rubidoxin and cytochromes and blue copper proteins – Photosynthesis - PS-I, PS-II, in vivo and in vitro nitrogen fixation.

Unit IV Inorganic chains, rings, cages and clusters

Homocyclic and hetrocyclic inorganic ring systems - Isopoly and heteropoly anions - Silicates, polysilicates and aluminosilicates, sulphur nitrides, borazines, Phosphazenes, phosphazene polymers - Synthesis, properties and structure of boranes, [styx notation] heteroboranes, metalloboranes and metallo carboranes, silicones, metal - metal bonds -

Clusters - carbonyl clusters, anionic and hydrido clusters, carbide clusters, sulphur metal clusters, Wade's rule - Isolobal relationships between main group and transition metal fragments.

Unit V Organometallic Chemistry

16 and 18 electron rules, synthesis, structure and bonding in mono and polynuclear metal carbonyls, nitrosyls, carbonylate ions, carbonyl hydride complexes, dinitrogen as ligands in organometallic compounds - Wade-Mingos-Lauher rules, Isolobal analogies IR of carbonyl coumpounds - Synthesis and reactivity of metal alkyls, carbenes, carbynes, carbides, alkenes, alkynes, and arene complexes - Metallocenes and bent metallocenes - Bonding in metallocenes.

References

1. James. E. Huheey , Ellen. A. Keiter and Richard. L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, Harper Collins College Publishers, 4th Edition, 1993.
2. Shriver D.F., Atkins P.W. and Langford C.H., inorganic chemistry, ELBS, Oxford university Press, 1994.
3. Gary L. Miessler, Donald A. Tarr, Inorganic chemistry. Pearson Publications, third edition.
4. Catherine Housecroft, Alan G. Sharpe-Inorganic Chemistry (3rd Edition), Prentice Hall , 2007.
5. Albert Cotton. F, Geoffrey Wilkinson, Carlos. A. Manic and Manfred Bochman, Advanced Inorganic Chemistry, Wiley Interscience Publication , 6th edition, 1999.
6. Purcell K.F. and Kotz J.C, Advanced Inorganic Chemistry , Saunders Golden Publishers
7. Rohatgi Mukherjee K.K., Fundamentals of Photochemistry, New age international limited.
8. Gurdeep Raj, Advanced Inorganic chemistry II, Goel publishing house, Krishna prakashan media (P) Ltd.
9. Robert H. Crabtree, The Organometallic Chemistry Of The Transition Metals, John Wiley & Sons, Inc., Publication, 4th Edn.
10. Lee J.D., Concise Inorganic Chemistry, Blackwell Science Ltd., 5th Edition, Reprint 2003.

SEMESTER – IV			
	Core IX	Organic Chemistry - III	
Code : 17PCHC42	Hrs / Week : 6	Hrs / Sem : 90	Credits : 4

Unit I Spectroscopy I

UV – Visible and IR spectroscopy - Absorption laws - Types of electronic transitions –Instrumental and Sampling – Solvent effect – Application of Woodward- Fieser rule to calcualte λmax values of conjugated diene, triene, polyenes, α and β unsaturated carbonyl compounds - Optical rotatory dispersion and circular dichroism - Octant rule, α-haloketone rule and their applications.

IR spectroscopy – Instrumentation - Characteristics of IR absorption of different functional groups - Factors influencing vibrational frequencies - Hydrogen bonding - Inter and intra molecular hydrogen bonding.

Unit II Spectroscopy II

PMR spectroscopy - Basic principle - Number of signals - Chemical shift - Factors influencing chemical shift - Spin–spin coupling in AX, ABX type molecules - Geminal, vicinal and long range coupling - NOE in stereochemistry - FT-NMR - C^{13} NMR - 2D NMR – COSY – NOESY - INADEQUATE - DEPT - Broad and off resonance decoupling applications.

Unit III Spectroscopy III

Mass spectrometry - Instrumentation- Basic principles - Techniques of Ion production – EI, CI, FD, FAB, ESI-MS, MALDI-MS - Base peak - Molecular ion - Nitrogen rule - Metastable ion - Isotope ion - Daughter ion - Calculation of molecular formula - Fragmentation pattern of various classes of organic compounds - Hydrocarbons, alcohols, amines, aldehyde, ketone, ether, ester, acids and phenols - Mc-Lafferty rearrangement - Problems on combined applications of UV -Visible, IR, NMR and Mass spectrometric methods to structural elucidation of organic compounds.

Unit IV Conformational Analysis

Conformations of mono and disubstituted cyclohexanes - Effect of hydrogen bonding - Dipole and steric effects on the disubstituted cyclohexanes – Conformational analysis and

reactivity of acyclic and cyclic compounds (6 members) – Conformational analysis of decalin and perhydrophenanthrene - Curtin-Hammett principle.

Unit V Some typical reactions and applications in organic synthesis and Green Chemistry

C-C and C= C bond forming reactions - Acylation and alkylation - Mannich – Reimer- Tieman – Reformatsky – Ullmann - Storck Enamine – Shapiro - Wittig – Horner - Peterson, Heck - Mc.Murray reactions - Ring formation by Dieckmann, Acyloin condensation, Simmons- Smith reaction - Reduction and oxidation in synthesis - Catalytic, hydrogenation - Wolff-kishner, reduction - Oppenauer oxidation

Solid state and non solid state microwave assisted reaction – Stille reaction - suzuki reaction – Krohnka reaction – Fuyama reaction- sonogashira reaction.

References

1. Silverstein R M and Bassler G C, Spectrometric Identification of Organic Compounds, Fourth Edition, John- Wiley and Sons, New York (1993).
2. Ahluwalia V.K and Parshar R.K, Organic Reaction Mechanism Second Edition , Narosa Publishing House , 2005.
3. Finar I L, Organic Chemistry Volume I and II, Sixth Edition, ELBS with Longmann, Singapore (1997).
4. March J, Advanced Organic Chemistry, Fourth Edition, John-Wiley andSons, New York (1992).
5. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol II, Himalaya Publishing House, Bombay, (2003).
6. Nasipuri D, Stereochemistry of Carbon Compounds, Second Edition, New-Age International Publishers, New Delhi (1996).
7. P.S.Kalsi, Organic Reaction and their Mechanisms, New Age International, Third edition, (2011)
8. Warren S, A Programmed Synthon approach- John Wiley & Sons
9. Ahluwalia, V. K and Rajender S. Varma, Green Solvents for Organic synthesis, Narosa Publishing House Pvt. Ltd. (2009).
10. Paul T Anastas, Text Book on Green Chemistry, OUP, (2006).

SEMESTER – III			
Core Elective - II Phytochemistry and Photochemistry			
Code : 17PCHE31	**Hrs / Week : 5**	**Hrs / Sem : 75**	**Credits : 5**

Unit I Biomolecules

Synthesis and reactions of oxazole, imidazole, coumarins, benzopyrazole and anthocyanins - synthesis of flavones - Pyranose and furanose forms of aldohexose and ketohexose - Methods used for the determination of ring size - Structural elucidation of maltose, sucrose and lactose - Starch and cellulose - Nucleic acids, nucleotides, polynucleotides and nucleosides.

Unit II Alkaloids and Terpnoids

Alkaloids – Introduction - General methods of extraction – Classification - Degradation studies - HEM, Emde and Von-Braun - Structural elucidation of papaverine, morphine and quinine, cocaine.

Terpenoids – Introduction - General methods to elucidate the structure of terepenes - Structural determination of camphor, zingiberine, α-pinene and squalene.

Unit III Steroids

Classification – Structural elucidation of cholesterol and ergosterol – Structural elucidation of androsterone, testosterone, progesterone and Oestrone.

Conversion of Cholesterol into androsterone, progesterone, testosterone, 5α- and 5β-Cholanic acid - Conversion of Oestrone to Oestriol.

Unit IV Photochemistry and Green Chemistry

Photochemistry - Basic principles - Jablonski diagram - Photosensitization - Photochemical reactions - Photoreduction – Photooxidation - Photochemical rearrangemen t- Norrish type I and II reactions - Paterno-Buchi reaction, Barton reaction and di- π methane rearrangement.

Green Chemistry - Twelve principles, atom economy- addition and rearrangement reaction, substitution reaction, elimination reaction - Green solvents - Supercritical CO_2, H_2O, Ionic liquids.

Unit V Pericyclic reactions

Atomic and molecular orbitals – Woodward-Hoffmann rules - FMO and MO correlation diagram approaches - Electrocyclic reactions - con and dis rotatory motions for 4n and 4n+2 system (butadiene and 1,3,5-hexatriene) - Stereochemical course of electrocyclic reaction in terms of conservation of orbital symmetry - Cycloaddition - suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene) – Sigmatropic rearrangements - [i,j] shift of C-H and C-C bonds (1,3 1,5 and 3,3 system).

References

1. Finar I L, Organic Chemistry Volume I and II, Sixth Edition, ELBS with Longmann, Singapore (1997).
2. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol II, Himalaya Publishing House, Bombay, (2003).
3. Nasipuri D, Stereochemistry of Carbon Compounds, Second Edition, New-Age International Publishers, New Delhi (1996).
4. Ahluwalia, V. K and Rajender S. Varma, Green Solvents for Organic synthesis, Narosa Publishing House Pvt. Ltd. (2009).
5. Paul T Anastas, Text Book on Green Chemistry, OUP, (2006).

Semester – III			
Project			
Code : 17PCHP31	**Hrs / Week : 4**	**Hrs / Sem : 60**	**Credits : 4**

Format for preparation of project report

1. Identification of the problem

Students are given the freedom of choosing the topic of the project. It may be theoretical or practical.

2. Arrangement of contents

The sequence in which the project report material should be arranged and bound should be as follows:

- Cover page and Title page
- Bonafide Certificate
- Abstract
- Table of contents
- List of Tables
- List of Figures
- List of Symbols, Abbreviations & Nomenclature
- Chapters
- Appendices
- Books for Reference

3. Page dimension and binding specifications

- The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be printed in black letters and the text for printing should be identical.
- Total number of pages should not exceed 70.

4. Typing instructions

- The impression on the typed copies should be black in colour.
- One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style “Times New Roman” & Font size 12.

SEMESTER – III	
Self Study	**Chemistry For National Eligibility test - II**
Code : 17PCHSS2	**Credit : 1**

Inorganic Chemistry

1. Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.
2. Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
3. Transition elements and coordination compounds: reaction mechanisms.
4. Organometallics in homogeneous catalysis.
5. Cages and metal clusters.
6. Bioinorganic chemistry: photosystems, porphyrins, oxygen transport, electron-transfer reactions; nitrogen fixation.
7. Characterisation of inorganic compounds by NMR, EPR, NQR, and microscopic techniques.
8. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

Organic Chemistry

1. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
2. Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.
3. Pericyclic reactions – electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.
4. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O,N,S).
5. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.

6. Structure determination of organic compounds by IR, UV-Vis, ^{1}H & ^{13}C NMR and Mass spectroscopic techniques.

Physical Chemistry

1. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.
2. Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems.
3. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.
4. Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis.
5. Solid state: Crystal structures; Bragg's law and applications; band structure of solids.

SEMESTER – IV			
Common Core - Nanoscience And Technology			
Code : 17PPCC41	**Hrs / Week : 6**	**Hrs / Sem : 90**	**Credits : 4**

Unit I Introduction

History of Nanotechnology - Nano structures - importance of nanomaterials - Synthesis of nanomaterials - Physical methods - Laser Ablation, Evaporation, Sputtering and solvated metal Dispersion - Chemical methods - Thermolysis, Sonochemical approach, reduction of metal ions by hydrogen and Methanol - Biosynthesis (Elementary idea only).

Unit II Preparation and characterisation

Structural characterisation (X-ray diffraction, Scanning Tunneling Microscopy, Atomic force microscopy) - Properties of nanomaterials (Optical, Electrical and magnetic properties) – Synthesis of semiconductor nanomaterials (Precipitation methods, Thermal decomposition of complex precursors) - Synthesis of Ceramic nanomaterials - Physical methods (Gas condensation and Laser methods) - Chemical method (Sol-gel synthesis).

Unit III- Carbon nanotube

Carbon nanotube - Carbon allotropes (Diamond, Graphite, Carbon nanotubes) - Types of Carbon nanotubes – Graphene sheet to single walled nanotube - Synthesis of carbon nanotubes (Electric arc - Discharge method, Laser method, Fluidised bed CVD method, Solar production of Carbon nanotubes) - Purification and properties of Carbon nanotubes – Fullerenes - Purification and properties of Fullerenes.

Unit IV Quantum well, Quantum wire and Quantum dots

Introduction - preparation of Quantum nanostructures - Fermi gas and Density of states – Calculation of the density of states in 1, 2 and 3 dimension - Infrared detector - Quantum wire(Production, Structure, Use Quantum dot - Fabrication Techniques - Application of Quantum dots – Quantum dot information storage, Infrared photodetectors, Lasers.

Unit V Magneto electronics and Applications of Nanotechnology

Magneto electronics: Nanocrystalline soft magnetic materials - Permanent magnetic materials - Theoretical background - Super para magnetism - Coulomb blockade - Single electron transistor – Spintronics - Giant magneto resistance - Quantum Hall Effect - Fractional Quantum Hall Effect.

Applications of Nanotechnology: Chemistry and Environment - Energy applications of Nanotechnology - Information and Communication- Heavy industry - Consumer goods - Nano medicine - Medical applications of molecular nanotechnology (Nanorobots, Cell repair machines, nanonephrology).

Book for Study:

1. Nano Physics, Dr.Sr.Geraldin Jayam

Unit	**Book no.**	**Page No**
III	1	2.1-2.7,2.14-2.20,2.26-2.29
IV	1	4.1-4.10,4.15-4.30
V	1	5.1-5.5,5.10-5.30

Book for Reference

1. Shanmugam.S, Nanotechnology, MJP Publishers, Chennai(2011)
2. Parthasarathy. B.K, Nanostructure and Nanomaterials, Isha Books, Delhi(2007)
3. Fahrner.W.R (Ed), Nanotechnology and Nanoelectronics- materials, Devices, measurement techniques, Spinger(2004)
4. Charles.P. Poole Jr Frank J. Owens;John Wiley & Sons inc.Publication(2003)
5. Massimiliano Di ventra, Stephane Evoy, James R. Heflin Jr(Editors) , Introduction to Nanoscale science and Technology Springer(2009)
6. Guozhong Cao, Nanostructures and Nanomaterials – Synthesis, Properties and Applications, Imperial College Press, London(2004).