



DR APJ ABDUL KALAM UNIVERSITY, INDORE

B.Sc. Under Graduate Semester wise Syllabus

(w.e.f. session 2016 onwards)

Class: - B.Sc.

Semester: - VI Semester

Subject: - Physics (BSP 603T)

Paper: - SOLID STATE PHYSICS AND DEVICES

Marks 85+15 CCE

Unit-I: SOLID STATE PHYSICS-1

Crystal Structure and bonding: Crystalline and amorphous solids. Translational symmetry. Lattice and basis. Unit cell. Reciprocal lattice. Fundamental types of lattices (Bravais Lattice). Miller indices Lattice planes. Simple cubic. Face centered cubic. Body centered cubic lattices. Laue and Bragg's equations. Determination of crystal structure with X-rays, X-ray spectrometer. Ionic, covalent, metallic, van der Waals and hydrogen bonding. Band theory of solids. Periodic potential and Bloch theorem. Kronig-Penny model (Qualitative).

Unit-II: SOLID STATE PHYSICS-2

Lattice structure and properties: Dulong Petit, Einstein and Debye theories of specific heats of solids. Elastic and atomic force constants. Dynamics of a chain of similar atoms and chain of two types of atoms. Optical and acoustic modes. Electrical resistivity. Specific heat of electron. Wiedemann-Franz law. Hall effect. Response of substances in magnetic field, dia-, para- and ferromagnetic materials. Classical Langevin theory of dia and paramagnetic domains. Curie's law. Weiss' theory of ferromagnetism and ferromagnetic domains. Discussion of BH hysteresis.

Unit-III: SEMICONDUCTOR DEVICES-1

Electronic devices: Types of Semiconductors (p and n). Formation of Energy Bands, Energy level diagram. Conductivity and mobility. Junction formation, Barrier formation in p-n junction diode. Current flow mechanism in forward and reverse biased diode (recombination), drift and saturation of drift velocity. Derivation of mathematical equations for barrier potential, barrier width. Single p-n junction device (physical explanation, current voltage characteristics and one or two applications). Two terminal devices. Rectification. Zener diode. Photo diode. Light emitting diode. Solar cell. Three terminal devices. Junction field effect transistor (JFET). Two junction devices. Transistors as p-n-p and n-p-n. Physical mechanism of current flow. Characteristics of transistor.

Unit-IV: SEMICONDUCTOR DEVICES-2

Amplifiers (only bipolar junction transistor). CB, CE and CC configurations. Single stage CE amplifier (biasing and stabilization circuits), Q-point, equivalent circuit, input impedance, output impedance, voltage and current gain. Class A, B, C amplifiers (definitions). RC coupled amplifiers (frequency response). Class B push-pull amplifier. Feedback amplifiers. Voltage feedback and current feedback. Effect of negative voltage series feedback on input impedance. Output impedance and gain. Stability, distortion and noise. Principle of an Oscillator, Barkhausen criterion, Colpitts, RC phase shift oscillators. Basic concepts of amplitude, frequency and phase modulations and demodulation.



Unit-V: NANO MATERIALS

Nanostructures: Introduction to nanotechnology, structure and size dependent properties. 3D, 2D, 1D, 0D nanostructure materials and their density of states, Surface and Interface effects. Modelling of quantum size effect. Synthesis of nanoparticles - Bottom Up and Top Down approach, Wet Chemical Method. Nanolithography. Metal and Semiconducting nanomaterials. Essential differences in structural and properties of bulk and nano materials (qualitative description). Naturally occurring nano crystals. Applications of nanomaterials.

References:

1. Introduction to Solid State Physics, C. Kittel, VIIIth Edition, John Wiley and Sons, New York, 2005.
2. Intermediate Quantum theory of Crystalline Solids, A. O. E. Animalu, Prentice–Hall of India private Limited, New Delhi 1977
3. Solid State Physics, N. W. Ashcroft, and N. D. Mermin, Harcourt Asia (P) Ltd. 2001
4. The Physics and Chemistry of Nanosolids: Frank J. Owens, and Charles P. Poole Jr., Wiley Inter Science, 2008
5. Physics of Low Dimensional Semiconductors: An introduction; J.H. Davies, Cambridge University Press, U.K., 1998



Dr. A.P.J. Abdul Kalam University, Indore (M.P)

B.Sc. Under Graduate Semester wise Syllabus

(w.e.f. session 2016 onwards)

Class: - B.Sc.

Semester: - VI Semester

Subject: - Mathematics (BSM 501T)

Paper: - Real Analysis, Discrete Mathematics and Optional

Unit-I

Riemann integral, Algebra of Riemann integrable functions, Integrability of continuous Unit-1 and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus

Unit-II

Definition and examples of metric spaces, Neighbourhoods, Limit points, Interior points, Open and closed sets, Closure and interior, Boundary points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Definition of Continuous functions and its illustrations.

Unit-III

Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of Unit-3 propositions, Quantifiers: Universal and Existential Quantifiers, Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.

Unit-IV

Boolean Function, Disjunction and Conjunction Normal Forms, Boole's Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial Order Relation.

Optional

This unit should be different from the main subject/paper studied during Semester I to Semester VI.

Graph Theory

Unit-V

Graphs, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths: Dijkstra's Algorithm, Matrix Representation of Graph: Incidence and Adjacency Matrix, Trees And its simple properties.

Or/

Elementary Statistics



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Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation, expectation of sum and product of random variables, Moment generating functions, Theoretical distribution: Binomial, Poisson distributions and their properties and uses.

Or

PRINCIPLES OF COMPUTER SCIENCE

Data Storage of bits Ram Memory. Mass storage. Coding Information of Storage. The Binary System Storing integers fractions, communication errors. Data Manipulation - The Central Processing Unit The Store Program concept. Programme Execution, Arithmetic/Logic Instruction. Computer-Peripheral Communication. Operation System : The Evolution of Operating System. (Dos, Window) Operating System Architecture. Coordinating the Machine's Activities. Other Architectures.

Or

MATHEMATICAL MODELING

The process of Applied Mathematics. Setting up first order differential equations. Qualitative solution sketching. Stability of solutions. Difference and differential equation models of growth and decay. Single species population model, Exponential and logistic population models.

Text Books:

1. R.R Goldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970.
2. G.F. Simmons. Introduction to Topology and Modern Analysis. McGraw-Hill, 1963.
3. T.M Apostol, Mathematical Analysis. Narosa Publishing House. New Delhi, 1
4. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science series 1986.
5. म.प्र हिन्दी ग्रंथ अकादमी की पुस्तकें A

Reference Books:

1. T.M Apostol, Mathematical Analysis. Narosa Publishing House. New Delhi, 1985.
2. S. Lang. Undergraduate Analysis, Springer-Verlag, New York, 1983.
3. D. Somasundaram and B. Choudhary, A first Course in Mathematical Analysis. Narosa Publishing House, New Delhi 1997.
4. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. Delhi.



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5. RK. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi 2000.
6. P.K. Jain and K. Ahmed Metric Spaces, Narosa Publishing House, New Delhi, 1996.
7. S. Lang, Undergraduate Analysis, Springer-Verlag, New York 1983.
8. E.T. Copson, Metric Spaces, Cambridge University Press, 1968
9. S. Lang. Undergraduate Analysis, Springer-Verlag, New York, 1983.

Optional Papers

1. Graph Theory

Text Book:

1. Narsingh Deo : Graph Theory, McGraw Hill.
- 2 म.प्र. हिन्दी ग्रंथ अकादमी की पुस्तकें ।

2. Elementary Statistics

Text Book:

1. Statistics by M. Ray
2. Mathematical Statistics by J.N Kapoor, H.C Saxena (S. Chand)
- 3 म.प्र. हिन्दी ग्रंथ अकादमी की पुस्तकें ।

References Book:

1. Fundamentals of Mathematical Statistics, Kapoor and Gupta

3. Principles of Computer Science

Text Book:

1. J. Glen Brookshear, Computer Science: An Overview, Addison- Wesley.
2. Stanley B. Lippman, Josee Jojoie. C++ Primer(3rd Edition), Addison- Wesley Total at least ten practicals
- 3 e-iz- fgUnh xzaFk vdkneh dh iqLrdsaA

4. Mathematical Modeling

Text Book:

1. Kapoor, J.N. : Mathematical models in Biology and Medicine. EWP (1985)\
2. SAXENA V.P. : Bio-Mathematical an introduction, M.P. Hindu Growth Academy 1993
3. Martin Braun C.S. Coleman, DA Drew (Eds.) Differential Equation Models.
4. Steven J.B. Lucas W.P., Straffin B.D. (Eds.) Political and Related Models, Vol. 2
- 5 म.प्र. हिन्दी ग्रंथ अकादमी की पुस्तकें ।
1. Cullen Linen Models in Biology.
2. Rubinoe, SI : Introduction yo Mathematical Biology. John Wiley and Sons 1975.



Dr. A.P.J. Abdul Kalam University, Indore (M.P)

B.Sc. Under Graduate Semester wise Syllabus

(W.e.f. session 2016 onwards)

Class: B.Sc.

Semester: VI Semester

Subject: Chemistry (BSC602T)

Marks 85+15 CCE

Unit-I

A. Amino acids: Classification, structure, stereochemistry of amino acids, acid base behavior, isoelectric point, general methods of preparation and properties of α -amino acids. Proteins and peptides. Introduction to peptides linkage, end group analysis, classification, properties and structure of proteins (primary, secondary and tertiary).

B. Nucleic acids: Introduction of nucleic acids and constituents of nucleic acid Ribonucleosides, Ribonucleotides, double helical structure of DNA.

C. Elementary idea of Fats, Oils & Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, Saponification value, iodine value, acid value.

Unit-II

A. Organometallic Chemistry: Synthesis; structure and π bonding in metal carbonyl complexes, metal olefin complexes and metal alkyne complexes. Oxidative addition reactions.

B. Organometallic Compounds: Organomagnesium Compound - Grignard Reagent and Organolithium Compounds, methods of preparation, structure and synthetic applications.

Unit-III

A. Magnetic properties of transition metal complexes: magnetic moment (spin only and with L-S coupling), orbital contribution magnetic moment.

B. Electronic spectra of transition metal complexes: Spectroscopic ground and excited states, types of electronic transitions, selection rules for d-d transitions, Orgel-energy level diagram for d1 to d9 states.



C. Water Analysis: Hardness, types of hardness, acidity and alkalinity, BOD, COD and DO.

Unit-IV

A. Infrared spectroscopy : Statement of the Born-Oppenheimer approximation, rotational spectrum of diatomic molecules. Energy levels of a rigid rotator, selection rule, intensity of absorption bands, Maxwell- Boltzmann distribution and population of energy levels.

B. Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity and qualitative relation of force constant and bond energies, degree of freedom and modes of vibration, vibrational frequencies of different functional groups.

C. Raman Spectroscopy: concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules. Selection rules, application of Raman spectrum.

Unit-V

A. NMR Spectroscopy Principle and Instrumentation, NMR active nucleus, chemical shift, spin-spin coupling, spectrum of ethanol and ethanal.

B. Surface Phenomena and Catalysis: adsorption of gases and liquids on solid adsorbent, Freundlich and Langmuir adsorption isotherms, determination of surface area, characteristics and mechanism of heterogeneous catalysis.

Books Suggested:-

1. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern
3. Organic Chemistry, Morrison and Boyd, Prentice Hall.
4. Organic Chemistry, L.G. Wade Jr. Prentice Hall
5. Fundamentals of Organic Chemistry Solomons, John Wiley.
6. Organic Chemistry, Vol. I, IIL S.M. Mukherji, S.P. Singh and R.P. Kapoor,
7. Organic Chemistry, F.A. Carey, McGraw-Hill Inc.
8. Introduction to Organic Chemistry, Streitwieser, Heathcock and Kosover, Macmillan.
9. Vogel's Qualitative & quantitative Analysis Vol- 1, 2, 3, ELBS.
10. Advanced Organic chemistry, I. L. Finar, ELBS.
11. Basic Concepts of Analytical chemistry, S M Khopker, New Age International Publishers.



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12. Analytical Chemistry, R.M. Verma, CBS Publication.
13. Analytical Chemistry, Skoog & West, Wiley International.
14. Essentials of Physical Chemistry, B.S. Bahl, Arun Bahl & G.D. Tuli, S. Chand & Company Ltd.
15. Atomic structure and Molecular spectroscopy, Manas Chanda, New Age International Publishers.
16. Molecular Spectroscopy, Sukumar, MJP Publishers.
17. Organic Chemistry, Mac Murrey, Pearson Education.
18. Inorganic Chemistry – J.D. Lee, John Wiley
19. Inorganic Chemistry – Cotton and Wilkinson, John Wiley
20. Inorganic Chemistry – Huheey, Harper Collins Pub. USA
21. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House
- 22^ण मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक।
- 23^ण मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।



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Class: B.Sc.

Semester: - VI Semester

Subject: Chemistry (BSC602P)

M.M. 50

Time: 6 Hours

Organic Chemistry: -

12 Marks

Binary mixture analysis containing two solids : Separation, identifications and preparation of derivatives.

A. Physical Instrumentation

12 Marks

- (i) Job's Method
- (ii) Mole-ratio method

B. Inorganic Chemistry

12 Marks

- (i) Effluent Analysis
Identification of cations and anions in different water samples.
- (ii) Water analysis
To determine the amount of dissolved oxygen in water samples
- (iii) Determination of Hardness of Water.

Viva

06 Mark

Sessional

08 Marks