## Faculty of Science
## Sixth Semester - Bachelor of Science (Math)

## Subject: Chemistry
## CODE: BSCM-601A

### UNIT-I

**A. Amino acids:** Classification, structure, stereochemistry ofaminoacids, acid base behaviour, isoelectric point, general methods of preparation and properties of _-amino acids. Proteins and peptides. Introduction to peptides linkage, end group analysis, classification, properties and structure of proteins (primary, secondary and tertiary).
**B. 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 bonding in metal carbonyl complexes, metal olefin complexes and metal alkyne complexes. Oxidative addition reactions.
**B. Organometallic Compounds:** Organ magnesium Compound - Grignard Reagent and Organ lithium 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 transitions, Orgel-energylevel 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. 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, NMRactive 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.

**Recommended Books**

**1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi**
**2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill.**
**3. The Elements of Physical Chemistry, P.W. Atkins, Oxford Uni v er s i t y Press**

**4. Organic Chemistry, Morrison and Boyd, Prentice Hall.**
**5. Organic Chemistry, L.G. Wade Jr. Prentice Hall**
**6. Fundamentals of Organic Chemistry Solomons, John Wiley.**

**B.Sc. Semester VI**
**Chemistry**
**Paper: Practical**

**Organic Chemistry Binary** mixture analysis containing two solids: Separation, identification and
Preparation of derivatives.

**A. Physical Instrumentation**
(i) Job's Method
(ii) Mole-ratio method

**B. Inorganic Chemistry**
(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 in ppm units.

(iii) Determination of Hardness of Water

# Faculty of Science
## Sixth Semester - Bachelor of Science (Math)

## Subject: Physics
## Solid State Physics and Devices
## CODE: BSCM-602B

### 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 (Bravias 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 bon ding.Band theory of solids.Periodic potential and Bloch theorem.Kronig-Penny model (Qualitative).

### UNIT-II

**Solid State Physics-2**

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

### UNIT-III

**Semiconductor Devices-1**

**Electronic devices**: Types of S emiconductors (p and n). Formation of Energy Bands, Energy level diagram.Conductivity and mobili ty.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 mathema tical equations for barrier potential, barrier width.Single p-n junction device (physical explanation, cu rrent voltage characteristics and one or two applications).Two terminal devices.Rectification.Zener diod e.Photo diode. Light emitting diode. Solar cell.Three terminal devices.Junction field effect tr ansistor (JFET).Two junction devices.Tran sistors as p-n-p and n-p-n.Physical mechanism of current flow. Characteristics of transistor.

### UNIT-IV

**Semiconductor Devices-2**

Amplifiers (only bipolar junctio n transistor).CB, CE and CC configuration s.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 cou pled amplifiers (frequency response). Class B push-pull amp lifier.Feedback amplifiers.Voltage

feedback and current feedback.Effect of negative voltage series feedba ck on input impedance.Output impedance a nd gain.Stability, distortion and noise.Principle of an Oscil lator, Barkhausen criterion, Colpitts, RC p hase shift oscillators.Basic concepts of amplitude, frequency and phase modulations and demodulation.

**UNIT-V**

**Nano Materials**

**Nanostructures**: Introduction to nanotechnology, structure and size depend ent properties. 3D, 2D, 1D, 0D nanostructure materials and their density of states, Surface and Inter face effects. Modelling of quantum size effect.Synthesis of nanoparticles - Bottom Up and Top Dow n approach, Wet Chemical Method.Nanolithography.Metal and Semiconducting nanomaterials.Essential differences in structural and properties of bulk and nano materials (qualitative description).N aturally occurring nano crystals.Applications of nanomate rials.

**References:**

**1 Introduction to Solid State Phys ics, C. Kittel, VIII th Edition, John Wiley and Sons, New York, 2005.**

**2 Intermediate Quantum theory of Crystalline Solids, A. O. E. Animalu, Pr entice−Hall of India private Limited, New Delhi 1977**

**3 Solid State Physics, N. W. Ashc roft, 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. Da vies, Cambridge University Press, U.K., 1998.**

## Faculty of Science
## Sixth Semester - Bachelor of Science (Math)

## Subject: Mathematics

## (Complex Analysis, Discrete Mathematics
**CODE: BSCM-603B**

**UNIT- I**

Continuity and differentiability of Complex functions, Analytical function, Cauchy Riemann equation,

**UNIT- II**

Harmonic function, Mobius transformations, fixed points, cross ratio.

**UNIT- III**

Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of propositions, Quantifiers: Universal and Existential Quantifiers,

**UNIT- IV**

Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.

**UNIT- V**

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

**Text Books:-**

1. **Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.**
2. **C.L.Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science series 1986.**

**Reference Books:**

1. **T.M. Apostol, Mathematical Analysis Narosa Publishing House, New Delhi 1985**
2. **S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi.**
3. **R. V. Churchill & J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hili New. York. 1990**

## Faculty of Science
## Sixth Semester - Bachelor of Science (Math)

## Subject: - Boolean algebra
## CODE: BSCM-605A

### UNIT- I

Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements,

### UNIT- II

lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms.

### UNIT- III

Definition, examples and properties of modular and distributive lattices,

### UNIT- IV

Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn McCluskey method,

### UNIT- V

Karnaugh diagrams, switching circuits and applications of switching circuits.

**Books Recommended:**

**1. B A. Davey and H. A. Priestley, *Introduction to Lattices and Order,* Cambridge University Press, Cambridge, 1990.**
**2. Rudolf Lidl and Günter Pilz, *Applied Abstract Algebra,* 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.**

## Faculty of Science
## Sixth Semester - Bachelor of Science (Math)

## Subject: Graph Theory
## CODE: BSCM-605B

### UNIT- I

**Graphs:** Definitions & simple examples, Type of graph, Multi-graphs, Weighted Graphs, Walks ,Paths and Circuits, isomorphism of two graphs, a sub – graph and the complement of a graph.

### UNIT- II

**Shortest Paths**: Dijkstra's Algorithm, Matrix Representation of Graph: Incidence and Adjacency Matrix,

### UNIT- III

**Directed graph:** Directed graphs, Simple examples of Directed and undirected graphs, – Types of directed graphs – Digraphs and binary relations, directed paths and connectedness, Euler graphs.

### UNIT- IV

**Trees:** Definitions & simple examples, properties of Tree, Type of Tree, binary trees, regular trees, Routed trees, forest.

### UNIT- V

**Spanning Trees:** Definitions & simple examples, cut sets, spanning tree of a connected graph, Minimum Spanning Tree, Determine MST.

**Text Books:-**

1. **Narsingh Deo: Graph Theory, McGraw Hill.**
2. **Balakrishnan, R., Ranganathan, *A Textbook of Graph Theory,***