



**RAFFLES  
UNIVERSITY**

**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Chemistry**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 33(10+23)	
Subject	: Inorganic Chemistry	Paper Code	: CH-101

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing five short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each.

#### **UNIT-I**

**Atomic Structure:** Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbital's, quantum numbers, Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals.

#### **UNIT-II**

**Periodic Table:** General principles of periodic table, effective nuclear charge, Slater's rules. And Atomic ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination or evaluation, trends in periodic table (s&p block elements).

#### **UNIT-III**

**Covalent Bond:** Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (  $\text{BeF}_2$ ,  $\text{BF}_3$ ,  $\text{CH}_4$ ,  $\text{PF}_5$ ,  $\text{SF}_6$ ,  $\text{IF}_7$ ,  $\text{SO}_4^{2-}$ ,  $\text{ClO}_4^-$ ) Valence shell electron pair repulsion (VSEPR) theory to  $\text{NH}_3$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SF}_4$ ,  $\text{ClF}_3$ ,  $\text{ICl}_2^-$  and  $\text{H}_2\text{O}$ . MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

#### **UNIT-IV**

**Ionic Solids:** Ionic structures ( $\text{NaCl}$ ,  $\text{CsCl}$ ,  $\text{ZnS}$  (Zinc Blende),  $\text{CaF}_2$ ) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (mathematical derivation excluded) and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

#### **Suggested books:**

1. Inorganic Chemistry, by Malik, Tul, iMadan, S.Chand . & company.
2. A text book of Inorganic Chemistry, O P Tandon, G R Bathla Publication pvt. Ltd.
3. Inorganic Chemistry, by James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
4. Concise Inorganic Chemistry, by J. D. Lee, Oxford.
5. Inorganic Chemistry B.Sc. -I, by Ramesh Kapoor and R S Chopra, R. Chand. & company.
6. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
7. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.



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**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 2 Hrs</b>	
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 33(10+23)</b>
<b>Subject</b>	<b>: Organic Chemistry</b>	<b>Paper Code : CH-103</b>

***Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing five short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each.*

**UNIT-I**

**Structure and Bonding:** Localized and delocalized chemical bond, vander Waals interactions, and resonance conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison.

**Stereochemistry of Organic Compounds-I:** Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, mesocompounds, resolution of enantiomers, inversion, retention and racemization.

**UNIT-II**

**Stereochemistry of Organic Compounds-II:** Relative and absolute configuration, sequence rules, R & S systems of nomenclature, Geometric isomerism, determination of configuration of geometrical isomers, E & Z system of nomenclature, Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds, Newman projection and Sawhorse formulae, Difference between configuration and conformation.

**UNIT-III**

**Mechanism of Organic Reactions:** Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.

**UNIT-IV**

**Alkanes and Cycloalkanes:** IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. Cycloalkanes nomenclature, synthesis of cycloalkanes and their derivatives-photochemical (2+2) cycloaddition reactions, dehalogenation of dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations, theory of strainless rings.

**Suggested Books:**

1. Advanced Organic Chemistry, F.A. Carey and R.J. Sundburg, Plenum.

2. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
3. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International. 4. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.
5. Structure and Mechanism in Organic Chemistry, C.K. Ingold, CBC Publisher & Distributors, 1995.
6. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
7. Stereochemistry of Organic Compounds, E. L. Eliel and S. H. Wilen, Wiley Interscience.
8. Basic stereochemistry of organic molecules, S Sengupta, Book Syndicate Pvt. Ltd., Kolkata
9. Advanced Organic Chemistry: Reaction Mechanism, Reinhard Bruckner, Harcourt (India) Pvt. Ltd.
10. Organic reaction Mechanism, V K Ahluwalia and R K Prasher, Narosa Publishing House.

**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>	
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 34(10+24)</b>
<b>Subject</b>	<b>: Physical Chemistry</b>	<b>Paper Code : CH-105</b>

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing Six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each.

**UNIT-I**

**Gaseous States:** Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Explanation of behavior of real gases using Vander Waal's equation.

**UNIT-II**

**Critical Phenomenon:** Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship between critical constants and Vander Waal's constants. Critical compressibility factor. The Law of corresponding states. Lequifaction of gases.

**UNIT-III**

**Liquid States:** Structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their determination.

**UNIT-IV**

**Solid State:** Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices(iii) Law of symmetry. Symmetry elements of crystals, Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl.

**Liquid crystals:** Difference between solids, liquids and liquid crystals, types of liquid crystals, Applications of liquid crystals.

**Text Books:**

1. Physical Chemistry for B. sc. Students by S C Khetarpal, R. Chand & Co, New Delhi
2. Physical Chemistry for B. sc. Students by Puri, Sharma & Pathania

**SCHOOL OF SCIENCE**  
**Department of Chemistry**  
**(Syllabus and Scheme of Studies w.e.f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

Schedule per week Practical	: 6 Hrs	
Examination Time	: 4 Hrs	Maximum Marks: 50(30+20)
Subject	: Chemistry Lab-I	Paper Code : CH-107

**UNIT-I (Inorganic)**

**Volumetric Analysis**

- 1. Redo titrations:** Determination of  $\text{Fe}^{2+}$ ,  $\text{C}_2\text{O}_4^{2-}$  (using  $\text{KMnO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ )
- 2. Iodometric titrations:** Determination of  $\text{Cu}^{2+}$  (using standard hypo solution).
- 3. Complexometric titrations:** Determination of  $\text{Mg}^{2+}$ ,  $\text{Zn}^{2+}$  by EDTA.

**UNIT-II (Physical)**

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To prepare arsenious sulphide sol and compare the precipitating power of mono, bi and trivalent anions.

**UNIT-III (Organic)**

1. Preparation and purification through crystallization or distillation and ascertaining their purity through melting point or boiling point
  - (i) Iodoform from ethanol (or acetone)
  - (ii) *m*-Dinitrobenzene from nitrobenzene (use 1:2 conc.  $\text{HNO}_3$   $\text{H}_2\text{SO}_4$  mixture if fuming  $\text{HNO}_3$  is not available)
  - (iii) *p*-Bromoacetanilide from acetanilide
  - (iv) Dibenzalacetone from acetone and benzaldehyde
  - (v) Aspirin from salicylic acid

**Distribution of marks**

1. UNIT-I	10(6+4) Marks
2. UNIT-II	10(6+4) Marks
3. UNIT-III	10(6+4) Marks
4. Viva-voce	10(6+4) Marks
5. Lab Record	10(6+4) Marks

**Text Book:**

1. Practical Chemistry for B. Sc. By O P Pandey, D N Bajpai & S Giri S. Chand & Company Pvt Ltd.

**Books Suggested:**

1. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller, Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.
3. Systematic Qualitative Organic Analysis, H. Middleton, Edward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Edward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
6. Advanced practical chemistry, Jagdamba, Yadav and shrivastava, PragatiPrakasan
7. Advanced organic practical chemistry, J.N.Gurtu and R. Kappor, S. Chand

8. Advanced practical organic chemistry, N.K. Vishnoi, Vikas Publishing House
9. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G.H. Jeffery and J. Mendham, ELBS.
10. Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, revised, G. Svehla, Longman.
11. Practical Inorganic Chemistry, Marr and Rocket. Applied Chemistry by O.P. Virmani and A.K. Narula, New Age International.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Physics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 3 Hrs</b>		
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>	
<b>Subject</b>	<b>: Mechanics</b>	<b>Paper Code</b>	<b>: PHY-101</b>

*Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

**UNIT -I**

**Moment of inertia:** Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross – section, Acceleration of a body rolling down on an inclined plane.

**UNIT-II**

**Elasticity:** Elasticity, Hooke's law and elastic constants of isotropic solid, stress energy. Kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem, viscous fluids, surface tension and surface ENERGY, CAPILLARITY.

**UNIT -III**

**Theory of relativity:** Reference system, Inertial and Non-inertial frames, Galilean invariance and conservation laws, Newtonian Relativity Principle, Michelson-Morley experiment: search for ether, Lorentz transformations.

**UNIT -IV**

**Applications of theory of relativity:** Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence.

**Reference:**

1. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
2. Concepts of Modern Physics by Arthur Beiser
3. Properties of Matter by D.S. Mathur.



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**SCHOOL OF SCIENCE**  
**Department of Physics**  
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**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 3 Hrs</b>	
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>
<b>Subject</b>	<b>: Electricity &amp; Magnetism</b>	<b>Paper Code : PHY-103</b>

*Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

**UNIT -I**

**Vector background and Electric field:** Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.

**UNIT -II**

**Magnetism:** Magnetic induction, Magnetic flux, properties of divergence and curl of magnetic field. Theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of magnetization- hysteresis loop (Energy dissipation, hysteresis loss and importance of hysteresis Curve)

**UNIT -III**

**Electromagnetism:** Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.

**UNIT -IV**

**A.C. Analysis:** A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) (D) Capacitance, Inductance (LR) (c) Capacitance and Inductance (LC) (d) Capacitance, Inductance and Resistance (LCR), Series and parallel resonance circuit, Quality factor (sharpness of resonance).

**Reference:**

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India).
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala ( Tata McGraw Hill)
3. Introduction to Electrodynamics (3rd Edition). Author: David J. Griffiths





**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
Department of Physics  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

Schedule per week Practical	: 6 Hrs		
Examination Time	: 3 Hrs	Maximum	
Marks: 50(20+30)			
Subject	: Physics Lab-I	Paper Code	: PHY-105

**Special Note:-** Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.

- I. Each student has to perform a minimum number of experiments prescribed in the syllabus.
- II. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
- III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
- IV. The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.

### List of Experiments

1. To determine the height of terrestrial object using sextant.
2. To determine Earth's magnetic field using tangent Galvanometer.
3. Determination of Stefan's Constant.
4. To study the variation of semiconductor resistance with temperature and hence to Determine the Band Gap of semiconductor in the form of reverse biased P-N junction.
5. To determine specific resistance of a metallic wire using potentiometer.
6. Conversion of galvanometer into ammeter.
7. Conversion of galvanometer into voltmeter.
8. Calibration of a thermocouple by Potentiometer.
9. Viscosity of water by its flow through a uniform capillary tube.
10. Verify the Faraday Law using magnetic induction.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Mathematics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>		
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>	
<b>Subject</b>	<b>: Matrices and Statistics</b>	<b>Paper Code</b>	<b>: MA-101</b>

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

**UNIT-I**

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigen values, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.

**UNIT-II**

Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.

**UNIT-III**

Meaning of correlation and regression. Coefficient of correlation, Rank correlation, lines of regression. Properties of regression coefficients.

**UNIT-IV**

Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution, Mean, Variance and Fitting.

**Books Recommended:**

1. S. S Seth: A Text Books Mathematical Statistics
2. Shanti Narayan : A Text Books of Matrices.
3. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Mathematics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>		
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>	
<b>Subject</b>	<b>: Calculus</b>	<b>Paper Code</b>	<b>: MA-103</b>

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

**UNIT-I**

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

**UNIT-II**

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Chord of curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.

**UNIT-III**

Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.

**UNIT-IV**

Indeterminate forms, Partial differentiation, Homogenous function and Euler's theorem, Jacobians, Total differentials Chain rule of partial differentiation.

**Books Recommended:**

1. Differential and Integral Calculus: Shanti Narayan.
2. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
3. N. Piskunov: Differential and integral Calculus. Peace Publishers, Moscow.
4. GorakhPrasad: Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
5. GorakhPrasad: Integral Calculus. Pothishala Pvt. Ltd., Allahabad.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Mathematics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>		
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>	
<b>Subject</b>	<b>: Three- Dimensional Geometry</b>	<b>Paper Code</b>	<b>: MA-105</b>

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

**UNIT -I**

General equation of second degree, Tracing of conics, System of conics, Confocal conics, Polar equation of a conic and its properties.

**UNIT -II**

Three dimensional systems of co-ordinates, Projection and direction cosines, plane and Straight line.

**UNIT-III**

Sphere: Plane section of a sphere. Sphere through a given circle. Cones: Right circular cone, enveloping cone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder

**UNIT-IV**

Central Conicoids, Reduction of general equation of second degree, Tangent plane and Normal to conicoid, Generating lines, Plane sections.

**Books Recommended:**

1. S. P. Nigam S. S.Gangwar, Coordinary Geometry of Three Dimensions
2. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
3. P.K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of English and Humanities**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (I Semester)**

**Schedule per week Lectures** : 2Hrs  
**Examination Time** : 3 Hrs **Maximum Marks: 50(20+30)**  
**Subject** : English Communication Technique **Paper Code** : ECT-101

**UNIT I**

**Grammar:**

- |                    |                          |
|--------------------|--------------------------|
| 1. Tenses          | 2. Passive Voice         |
| 3. Indirect Speech | 4. Conditional Sentences |
| 5. Modal Verbs     |                          |

**UNIT II**

**Composition:**

- |  |                                 |
|--|---------------------------------|
| 1. Dialogue Writing                          | 2. Paragraph and Précis Writing |
| 3. Report, its importance and Report Writing |                                 |

**UNIT III**

**Short Stories**

- |                               |  |
|-------------------------------|--|
| 1. The Luncheon: W.S. Maugham | 2. How Much Land Does a Man Need?: Leo Tolstoy |
| 3. The Last Leaf: O. Henry    |  |

**Poems:**

- |                                     |  |
|-------------------------------------|--|
| 1. The Unknown Citizen: W. H. Auden | 2. The Character of A Happy Life: Sir Henry Wotton |
| 3. No Men are Foreign: James Kirkup | 4. If : Rudyard Kipling                            |

**UNIT IV**

**Essays:**

1. On the Rule of the Road: A. G. Gardiner
2. The Gandhian Outlook: S. Radhakrishnan
3. Our Own Civilisation: C.E.M. Joad

**Suggested Readings :**

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma & Binod Mishra, PHI Learning Pvt. Ltd.
  2. English for Engineers: Made Easy, Aeda Abidi & Ritu Chaudhary, Cengage Learning, (New Delhi)
  3. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
  4. The Written Word, Vandana R. Singh, Oxford University Press (New Delhi)
  5. The Great Short Stories edited by D.C. Datta, Ram Narain Lal Publishers (Allahabad)
  6. "Current English Grammar and Usage with Composition" by R.P. Sinha, Oxford University Press (New Delhi).
  7. "Grammar of the Modern English Language", by Sukhdev Singh & Balbir Singh, Foundation Books (New Delhi).
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## RAFFLES UNIVERSITY, NEEMRANA, ALWAR

### SCHOOL OF SCIENCE

#### Department of Chemistry

(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)

#### B. Sc. I Year (II Semester)

Schedule per week Lectures	: 2 Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 33(10+23)	
Subject	: Inorganic Chemistry	Paper Code	: CH-102

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing five short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each.

#### UNIT-I

**Hydrogen Bonding & Vander Waals Forces:** Hydrogen Bonding-Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces. Metallic Bond and Semiconductors Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- types and applications.

#### UNIT-II

**s-Block Elements:** Comparative study of the elements including, diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems.

**Chemistry of Noble Gases:** Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.

#### UNIT-III

**p-Block Elements:** Emphasis on comparative study of properties of p-block elements(including diagonal relationship and excluding methods of preparation).

**Boron family (13th gp):** Diborane-properties and structure (as an example of electron-deficient compound and multicentre bonding), Borazine-chemical properties and structure Trihalides of Boron – Trends in Lewis acid character structure of aluminium (III) chloride.

**Carbon Family (14th group):** Catenation, p-d bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicon – general methods of preparations, properties and uses.

#### UNIT-IV

**Nitrogen Family (15th group):** Structures of oxides of N, P. oxyacids–structure and relative acid strengths of oxyacids of N and P. Structure of white, yellow and red phosphorus

**Oxygen Family (16th group):** Oxyacids of sulphur:- structures and acidic strength H<sub>2</sub>O<sub>2</sub> structure, properties and uses.

**Halogen Family (17th group):** Basic properties of halogen, interhalogens, types, properties, hydro and oxyacids of chlorine – structure and comparison of acid strength.

#### Suggested books:

1. Inorganic Chemistry, by Malik, Tulsi Madan, S.Chand . & company.
2. A text book of Inorganic Chemistry, O P Tandon, G R Bathla Publication Pvt Ltd
3. Inorganic Chemistry, by James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
4. Concise Inorganic Chemistry, by J. D. Lee, Oxford.

5. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley
6. Inorganic Chemistry, J.E. Huheey, Harper Collins.
7. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.
8. Inorganic Chemistry B.Sc. -I, by Ramesh Kapoor and R S Chopra, R. Chand .& company.



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Chemistry**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 2 Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 33(10+23)	
Subject	: Organic Chemistry	Paper Code	: CH-104

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing five short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each.

#### UNIT-I

**Alkenes:** Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydro-halogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes and mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ ,

#### UNIT-II

**Arenes and Aromaticity:** Nomenclature of benzene derivatives, Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, antiaromatic and non aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechanism of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams ; Activating ,deactivating substituents and orientation.

#### UNIT-III

**Dienes and Alkynes:** Nomenclature and classification of dienes isolated, conjugated and cumulated dienes. Structure of butadiene, Chemical reactions 1, 2 and 1, 4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes,

#### UNIT-IV

**Alkyl and Aryl Halides:** Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides,  $\text{SN}^2$  and  $\text{SN}^1$  reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

#### **Suggested Books:**

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundburg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
5. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.



6. Advanced Organic Chemistry: Reaction Mechanism, Reinhard Bruckner, Harcourt (India) Pvt. Ltd.
7. Organic reaction Mechanism, V K Ahluwalia and R K Prasher, Narosa Publishing House.
8. Organic Chemistry Vol-1 by AditiSangal from Krishna Publishers.
9. Organic reactions and their mechanisms by P S Kalsi New Age International Publishers.
10. Name Reactions Strategic Applications of Named Reactions in Organic Synthesis by Laszlo Kurti (Author), Barbara Czako from Elsevier.
11. Name Reactions and Reagents in Organic Synthesis by Bradford P. Mundy, Michael G. Ellerd and Frank G. Favaloro Jr. from Wiley.
12. Name Reactions: A Collection of Detailed Mechanisms and Synthetic Applications by Jie Jack Li from Springer.
13. The Art of Writing Reasonable Organic Reaction Mechanisms by Robert B. Grossman from Springer.
14. Organic Chemistry for B. Sc. By Jagmohan, R Chand & Co. New Delhi



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**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 2 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 34(10+24)
Subject	: Physical Chemistry	Paper Code : CH-106

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing Six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 4.5 marks each

**UNIT-I**

**Kinetics-I:** Rate of reaction, rate equation, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction,

**UNIT-II**

**Kinetics-II:** Effect of temperature on the rate of reaction-Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision, Transition state theory of Bimolecular reactions.

**UNIT-III**

**Electrochemistry-I:** Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, Arrhenius theory of ionization, Ostwald's Dilution Law, Debye- Huckel-Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included),

**UNIT-IV**

**Electrochemistry-II:** Kohlrausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlrausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity **Measurements:** determination of degree of dissociation, determination of  $K_a$  of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of  $pH$  and  $pK_a$ , Buffer solution, Buffer action, Henderson – Hazelequation, Buffer mechanism of buffer action.

**Text Books:**

1. Physical Chemistry for B. sc. Students by S C Khetarpal, R. Chand & Co, New Delhi
2. Principles of Physical Chemistry for B. sc. Students by Puri, Sharma & Pathania



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**B. Sc. I Year (II Semester)**

Schedule per week Practical	: 6Hrs	
Examination Time	: 4 Hrs	Maximum Marks: 50(30+20)
Subject	: Chemistry Lab-II	Paper Code : CH-108

**UNIT-I (Inorganic)**

**Volumetric Analysis**

**Complexometric titrations:** Determination of Hardness of Water by EDTA

**Paper Chromatography**

Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography ( $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$  and  $\text{PO}_4^{3-}$  and  $\text{NO}_3^-$ ).

**UNIT-II (Physical)**

1. To determine the surface tension of a given liquid by drop number method.
2. To determine the viscosity of a given liquid.
3. To determine the specific refractivity of a given liquid

**UNIT-III (Organic)**

To study the process of sublimation of camphor and phthalic acid,

**Distribution of marks**

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	(10 (6+4) marks
5. Lab Record	10 (6+4) marks

**Suggested Books:**

1. Advanced practical organic chemistry, N.K. Vishnoi, Vikas Publishing House
2. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G.H. Jeffery and J. Mendham, ELBS.
3. Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, revised, G. Svehla, Longman.
4. Practical Inorganic Chemistry, Marr and Rocket.
5. Applied Chemistry by O.P. Virmani and A.K. Narula, New Age International.



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**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 3 Hrs		
Examination Time	: 3 Hrs		Maximum
Marks: 50(20+30)			
Subject	: <b>Mathematical Physics and Mat lab</b>	Paper Code	: <b>PHY-102</b>

*Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

#### **UNIT I**

**Introduction to Mat lab:** Mat lab as best calculator, Standard Mat lab windows Operations with variables: Naming, Checking existence, Clearing, Operations, Arrays: Columns and rows: creation and indexing, Size & length, Multiplication, division, power, Operations

#### **UNIT II**

**Writing script files:** Logical variables and operators, Flow control, Loop operators, writing Functions: Input/output arguments, Function visibility, path, Example: Mat lab startup

#### **UNIT III**

**Complex Analysis:** Cauchy-Riemann conditions. Analytic functions. Cauchy's Integral Theorem for simply and multiply connected regions. Cauchy's Integral formula. Cauchy's inequality. Taylor and Laurent **Series**. Residue and Residue Theorem,

#### **UNIT IV**

**Special mathematical function:** Legendre, Bessel, Hermite and Laguerre functions, Generating function. Recurrence relations. Legendre, Bessel and Hermite differential equations. Orthogonality. Gamma functions and their properties

#### **Reference Books:**

1. Applied Mathematics for Engineers and Physicists – Pipes
2. Advanced Engineering Mathematics – Krysziq
3. Mathematical Physics- E.Bulkov ( Addison Wosley)
4. Mathematical Methods of Physicists – Arfken
5. Mathematical Methods in Physics – Mathews and Walker.
6. Advanced Engineering Mathematics, Erwin Kreyszing, John Wiley & Sons, Inc
7. Schaum outline series (Vector analysis, complex variable, Fourier Analysis), tata Mc Graw- Hill.

8. Mathematical Physics; a modern introduction to its foundation, Sadri Hassani,  
Springer- Verlag.

9. Mathematical Physics, A.K.Ghatak, I.C. Goyal, S.C.Chua.Macmillan India Ltd., 1995



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Physics**  
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**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 3 Hrs		
Examination Time	: 3 Hrs		Maximum
Marks: 50(20+30)			
Subject	: Semiconductor Devices	Paper Code	: PHY-104

*Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

**UNIT -I**

**Semiconductors:** Energy bands in solids, Intrinsic and extrinsic semiconductors, p-n junction diode and its equation. and their characteristics, Zener and Avalanche breakdown, Zener diode , Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, P-n junction, half wave and full wave rectifiers, Zener diode as a voltage regulator. Logic gates and its combination (basic idea).

**UNIT -II**

**Transistors:** Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes), Constants of a transistor, Relation between alpha and beta, Common base, Common emitter and common collector characteristics of transistor, Advantages and disadvantages of C-E configuration. Emitter follower.

**UNIT -III**

**Transistor Amplifiers:** Transistor amplifier, Methods a of transistor biasing and stabilization, D.C. load line , Common base and Common emitter biasing, Common base and common emitter amplifiers, Classification of amplifiers, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, Positive and negative feedback. Advantages of negative feedback,.

**UNIT -IV**

**Oscillators:** Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working). RC oscillator, Phase shift and Wein-Bridge oscillator. Advantage of of RC oscillator over LC oscillator.

**Reference:**

1. Basic Electronics and Linear Circuits by N.N.Bhargava. D.C. Kulshreshtha and S.C.Gupta (TITI CHD).
2. Principles of electronics by VK Mehta.



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**B. Sc. I Year (II Semester)**

<b>Practical per Week</b>	<b>: 6 Hrs</b>	
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum Marks: 50(20+30)</b>
<b>Subject</b>	<b>: Physics Lab-II</b>	<b>Paper Code : PHY-106</b>

**Note: Students are required to perform minimum six experiments from given list.**

- (1) To study and plot V-I characteristics of PN junction diode.
- (2) To Study and plot V-I characteristics Zener Diode.
- (3) To draw common emitter characteristics of a transistor and calculate transistor characteristics parameters.
- (4) To draw common base characteristics of a transistor and calculate transistor characteristics parameters.
- (5) To plot the waveform of the half wave rectifier and find the ripple factor for H.W.R.
- (6) To plot the waveform of the full wave bridge rectifier and analyze its output.
- (7) To study verify the truth table of all the logic gate.
- (8) To study Cathode Ray Oscilloscope (CRO).



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
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**Department of Mathematics**  
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**B. Sc. I Year (II Semester)**

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>		
<b>Examination Time</b>	<b>: 3 Hrs</b>	<b>Maximum</b>	
<b>Marks: 50(20+30)</b>			
<b>Subject</b>	<b>: Sequences and Series &amp; Trigonometry</b>	<b>Paper Code</b>	<b>: MA-102</b>

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each

**UNIT-I**

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

**UNIT -II**

Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Sub-sequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series: Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series. D-Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy's Nth root test.

**UNIT -III**

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

**UNIT- IV**

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.

**Books Recommended:**

1. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
2. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
3. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York
7. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
8. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.





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**(Syllabus and Scheme of Studies w.e.f. 2015-16 onwards)**  
**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Ordinary Differential Equations	Paper Code	: MA-104

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

**UNIT-I**

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for  $x, y, p$  Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

**UNIT-II**

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.

**UNIT-III**

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

**UNIT-IV**

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators  $x (d/dx)$  or  $t (d/dt)$  etc. Simultaneous equation of the form  $dx/P = dy/Q = dz/R$ . Total differential equations. Condition for  $Pdx + Qdy + Rdz = 0$  to be exact. General method of solving  $Pdx + Qdy + Rdz = 0$  by taking one variable constant. Method of auxiliary equations.

**Books Recommended :**

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longman(India) . 1967
2. A.R. Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd



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**Department of Mathematics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (II Semester)**

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: <b>Vector Calculus and Geometry</b>	Paper Code	: MA-106

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each

**UNIT-I**

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

**UNIT-II**

Gradient of a scalar point function, geometrical interpretation of  $\text{grad } \phi$ , character of gradient as a point function. Divergence and curl of vector point function, characters of  $\text{Div } \vec{f}$  and  $\text{Curl } \vec{f}$  as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

**UNIT-III**

Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokes and problems based on these theorems.

**UNIT-IV**

General equation of second degree. Tracing of conics Parabola, Ellipse and Hyperbola.

**Books Recommended:**

1. Murraray R. Spiegel: Vector Analysis, Schaum Publishing Company, New York.
2. N. Saran and S.N. Nigam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
3. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.
4. S.L.Loney, The Elements of Coordinate Geometry, Macmillan and company, London
5. P. K. Jain and Khalil Ahamad, A text book of Analytic Geometry of Two Dimensions Macmillan India Ltd. 1994.
6. Sharma and Sharma A Text Book of Vector Calculus Krishna Prakashan Media



## RAFFLES UNIVERSITY, NEEMRANA, ALWAR

### SCHOOL OF SCIENCE

#### Department of Chemistry

(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)

B. Sc. I Year (II Semester)

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Environmental science	Paper Code	: EVS-202

**Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

#### UNIT-I

**Basics of Environment:** Definition, Scope and basic principles of ecology and environment. Biological levels of organization, Functional concepts of Ecology, Basics of species, Ecosystem, Hydrological and chemical cycles, Energy flow in ecosystems. Biodiversity, population dynamics. Environmental Acts and Regulations, Environmental Impact Assessment (EIA), Necessity and methodology of EIA. Renewable sources of energy, Potential & present status of renewable sources of energy in India. Environmental education—women and value education

#### UNIT-II

**Air Pollution, Noise Pollution:** Environmental Pollution, Air Pollution, Harmful effects of Air Pollution, Control of Air Pollution. Global warming, Acid rain, Ozone depletion. Noise Pollution, Harmful effects of noise pollution, control of noise pollution.

#### UNIT-III

**Water Pollution:** Water pollution, Harmful effects of water pollution, control of water pollution. Waste water management, Treatment & disposal of wastewater. Reuse and saving in use of water, rain water harvesting.

#### UNIT- IV

**Solid Waste and Disaster Management:** Solid Waste Management, Classification of solid waste, Collection, transportation, treatment, and disposal of solid waste. Economic recovery of solid waste. Sanitary landfill, on site sanitation.

**Type of Disasters:** Natural and Manmade (Earthquake, Tsunami, Cyclone, Flood, Drought, Landslides, Fire and Environmental Hazards). Disaster Management Cycle and its components. Do's and Don'ts for safety during these disasters. Earthquake.

#### Recommended Textbook:

1. RobertRicklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.

2. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.
3. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
4. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York.
5. Botkin, D.B. and Keller, E.A. 2000. Environment Science: Earth as a living planet. Third Edition. John Wiley and Sons Inc.
6. Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.
7. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
8. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
9. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
10. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India,
11. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
12. Textbook of Environment Ecology , Singh, Acme Learning
13. Perspective in Environmental Studies, Kaushik, New Age International
14. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

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