RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Chemistry

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 33(10+23)**
Subject : Inorganic Chemistry **Paper Code : CH-301**

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

Metal-ligand bonding in Transition Metal Complexes: Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field split ting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

UNIT-II

Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt (II).

UNIT-III

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of s and eff- values, orbital contribution to magnetic moments, application of magnetic moment data for 3dmetalcomplexes.

UNIT-IV

Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energylevel diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complexion.

Suggested books:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huheey, HarperCollins.
3. Magnetochemistry, R.L. Carlin, Springer Verlog.
4. Magnetochemistry, A. Earnshaw.
5. Introduction to ligand fields, B.N. Figgis, Wiley Eastern-IIed.
6. Inorganic Chemistry, by Malik, Tul,iMadan, S.Chand . & company.
7. Inorganic Chemistry B.Sc. -V, 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. III Year (V Semester)

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 33(10+23)**
Subject : Organic Chemistry **Paper Code : CH-303**

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

NMR Spectroscopy-I: Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift, shielding and de-shielding of protons, proton counting, splitting of signals and coupling constants, magnetic equivalence of protons.

UNIT-II

NMR Spectroscopy-II: Discuss ion of PMR spectra of the molecules: ethyl bromide, n-propylbromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone. Simple problems on PMR spectroscopy for structure determination of organic compounds.

UNIT-III

Carbohydrates-I: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inter-conversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D (+)-glucose &D (-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.

UNIT-IV

Carbohydrates-II: An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Organometallic Compounds:

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

Suggested Books:

1. Principles of Biochemistry, A. L. Lehninger, Worth Publishers.
2. Biochemistry, L.Stryer, W.H.Freeman.
3. Biochemistry, J. David Rawn, Neil Patterson.
4. Biochemistry, Voet and Voet, John Wiley.
5. Organic chemistry For B. Sc. III Year By P Bhagchandani, Sahitayabhawan Publications.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Chemistry

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 33(10+23)**

Subject : Physical Chemistry **Paper Code : CH-305**

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

Quantum Mechanic s-I: Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonial operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance,

UNIT-II

Physical Properties and Molecular Structure: Optical activity, polarization-(clausius-Mossottiequation). Orientation of dipoles in an electric field, dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

UNIT-III

Spectroscopy-I: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born openheimer approximation, Degrees of freedom.

Rotational Spectrum: Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT–IV

Spectroscopy-II, Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of an harmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra

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

Books Suggested

1. Physical Chemistry, P.W. Atkins, Oxford University Press.
2. Physical Chemistry, G.W. Castellan, Narosa. Publishers, New Delhi
3. Principles of Physical Chemistry, Puri, Sharma &Pathania, Vishal Pub.
4. Introductory Quantum Chemistry, A.K. Chandra, Tata McGraw Hill.
5. Quantum Chemistry, I.M. Levine, Prentice Hall.
6. Quantum Mechanics, M.L. Strause, Prentice – Hall
7. Quantum Chemistry, J. P. Lowe & K. Peterson, Academic Press (2005).
8. Theoretical Chemistry, Samual Glasstone Affiliated East-West Press.
9. Molecular Quantum Mechanics, P.W. Atkins & R.S. Friedman, 3rd Ed. Oxford University Press (1997).
10. Modern Spectroscopy, J.M. Hollas, John Wiley.
11. Chemical Applications of Group Theory, F.A. Cotton.
12. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill.
13. Basic Principles of Spectroscopy, G.M. Barrow, McGraw Hill.
14. Fundamentals of molecular spectroscopy, C. N. Banwell, Tata Macgraw Hill.
15. Physical Methods in Chemistry, R.S. Drago, Saunders College.
16. Modern Spectroscopy, J.M. Hollas, John Wiley.
17. Applied Electron Spectroscopy for Chemical Analysis Ed. H. Windawi and F.L. Ho, Wiley Interscience.
18. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Chemistry

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

B.Sc. III Year (V Semester)

Schedule per week Practical : 6 Hrs
Examination Time : 4 Hrs **Maximum Marks: 50(30+20)**
Subject : Chemistry Lab-V **Paper Code : CH-307**

UNIT-I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insolubles):
$Pb^{2+,}$ Hg^{2+} , $Hg_2^{2+,}$ Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+} , Sb^{3+}, Sn^{2+}, Fe^{3+} ,Cr^{3+}, Al^{3+} , Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+}, Mg^{2+},

UNIT-II (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically

UNIT-III (Organic)

Chromatography Method

Determination of Rf values and identification of organic compounds
(a) Separation of green leaf pigments (spinach leaves may be used)by paper chromatographic method
(b) Separation of a mixture of colored organic compounds using common organic solvents by TLC.

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. 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, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward 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

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 3 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Solid State Physics **Paper Code : PHY-301**

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

Crystal Structure I: Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.

UNIT-II

Crystal Structure II: X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

UNIT-III

Magnetic Material: Hall Effect. Magnetism-Dia, Para, Ferro-magnetic properties of materials. Electron spin and magnetic moment. Magnetic susceptibility

UNIT IV

Super conductivity: Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.

Reference Book:

1. C. Kittel, Introduction to Solid State Physics, 7th Ed (1996) John Wiley & Sons, New Delhi.
2. H. Ibach and H. Lüth, Solid State Physics, An Introduction to Theory and Experiment, Springer-Verlag, Berlin, 1991
3. Pillai O S, Solid State Physics, New Age International Publishers (2007) New Delhi
4. Mark R and Denial R, Nano-tecnology – A Gentle Introduction to the Next Big Idea (2002)
5. M. Tinkham, Introduction to Superconductivity, McGraw-Hill, New York, 1975
6. Dekkar A J, Solid State Physics (2000), Mc Millan India Ltd New Delhi
7. Ascroft N W and Mermin N D, Solid State Physics (2003) Harcourt Asia, Singapore
8. Keer H V, Solid State Physics (1993), Wiley Eastern Ltd, New Delhi
9. Kachhava C M, Solid State Physics (1990) Tata Mc Graw Hill Co Ltd, New Delhi
10. Gupta, Solid State Physics (1995) Vikas Publishing House Pvt Ltd, New Delhi

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 3 Hrs
Examination Time : 3 Hrs Maximum Marks: 50(20+30)
Subject : Quantum Mechanics Paper Code : PHY-303

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

Origin quantum physics (Experimental basis): Review of History of Origin of Quantum Mechanics-Plank's Quantum Hypothesis, black body radiation. Nature of Light, de Broglie Waves and Wave- Particle Duality, Heisenberg's Uncertainty Principle. Compton Effect. Phase velocity, group velocity and their relation.

UNIT-II

Operators: Linear Operators. Momentum operator, Energy operator, Hamiltonian operator, Eigen value problem. Eigen value of a Hermition and Unitary Operators. Property of Hermition operator. Expectation Values. Commutator bracket and Uncertainty relations.

UNIT III

Postulates of Quantum Mechanics: Derivation of 1-D, 2-D,3-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, Expectation values of dynamical quantities, probability current density.

UNIT-IV

Application of Schrodinger wave equation:

1. Free particle in 1-D, 2-D,3-D box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy).
2. One dimensional step potential E > VO (Reflection and Transmission coefficient)

3. One dimensional step potential E < VO (Penetration depth calculation).
4. One dimensional potential barrier, E > VO (Reflection and Transmission coefficient)
5. One-dimensional potential barrier, E < VO (penetration or tunneling coefficient).
6. Brief idea of energy and eigen function of Harmonic oscillator .

Reference Book:

1. Bransden B H and Joachain C J, Quantum Mechanics (2000), Pearson Education, NewDelhi
2. Liboff R L, Introductory Quantum Mechanics
3. Eisberg R M and Resnick R, Quantum Physics of Atoms Molecules, Solids, Nuclei and Particles, Wiley Eastern Ltd, New Delhi
4. Verdeyen J T, Laser Electronics PHI, New Delhi
5. Thorenton S T and Rex A, Modern Physics, (2007) Cengage Learning, New Delhi
6. Taylor J R, Zafiratos C D and Dubson M A, Modern Physics, 2nd Ed (2004), PHI, New Delh

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

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

B. Sc. III Year (V Semester)

Schedule per week Practical : 6 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Physics Lab-V **Paper Code : PHY-305**

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

1. Moment of Inertia of a fly-wheel.
2. M.I. of an irregular body using a torsion pendulum.
3. Surface tension by Jeager's Method.
4. Young's Modulus of steel bar using tensile
5. Modulus of rigidity by torsion method
6. Elastic constant by Scarle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. 'g' by Bar pendulum.
9. To verify the Bernoulies theorem.
10. To determine viscosity of a given fluid.
11. To calibrate the orificemeter.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Real Analysis **Paper Code : MA-301**

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

Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental Theorem of integral calculus. Mean value theorems of integral calculus.

UNIT-II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, μ- test, Integral as a function of a parameter. Continuity Differentiability and integrability of an integral of a function of a parameter.

UNIT-III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and Closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle.

UNIT-IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness, components, continuity in relation with connectedness.

Book s Recommended:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
2. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
4. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi

6. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
7. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Modern algebra **Paper Code : MA-303**

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

Nature of the roots of an equation Descarte's rule of signs. Definition of a group with examples and simple properties, permutation groups, subgroup, centre and normalizer, cyclic groups, Left and right cosets, Coset decomposition, Lagrange's theorem and its consequences.

UNIT-II

Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group, Fundamental theorem of homomorphism, conjugancy relation, class equation.

UNIT-III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

UNIT-IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is R[X1 , X2……Xn].

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2^{nd} edition).
3. VivekSahai and VikasBist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.
5. J.B. Gallian: Abstract Algebra, Narosa Publishing House.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Dynamics **Paper Code : MA-305**

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

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

UNIT-II

Motion of resisting medium, Constrained Motion (Circular and Cycloid only).

UNIT-III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

UNIT-IV

General motion of a rigid body.Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions.

Books Recommended:

1. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
2. F. Chorlton : Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.
4. M. Ray and G.C Sharma Dynamics S. Chand Publisher & Distributors

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

(Scheme of Studies & Examinations w. e. f. 2015-16 onwards)

B.Sc. III Year (V Semester)

Schedule per week Lectures : 2 Hrs **Maximum Marks: 50**

Examination Time : 0 **Paper Code : ECA-301**

Subject : Seminar

Lectures will be allotted by HOD/Dean

Student will be required to give seminar on the topic allotted. Each group will consist of two Students for the purpose of allocation of work load to the faculty

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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. III Year (VI Semester)

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 33(10+23)**
Subject : Inorganic Chemistry **Paper Code : CH-302**

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

Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls.

UNIT-II

Acids and Bases, HSAB Concept: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids &Bases. Symbiosis, electronegativity and hardness and softness

UNIT-III

Bioinorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}.Nitrogen fixation.

UNIT-IV

Silicones and Phosphazenes: Silicones and phosphazenes, their preparation, properties, structure and uses

Suggested Books:

1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
2. EnzoAlessio (Ed.), Bioinorganic Medicinal Chemistry, Wiley-VCH Verlag (2011).
3. Principles and Application of Organotransition Metal Chemistry, J.P. Collman, L.S. Hegsdus, J.R. Norton and R.G. Finke, University Science Books.
4. The Organometallic Chemistry of the Transition Metals, R.H. Crabtree, John Wiley.
5. Organometallic Chemistry, R.C. Mehrotra and A. Singh, New Age International.
6. Organometallics, A. Salzer, Ch. Elschenbrioch.VCH Publications.
7. Inorganic Chemistry, by Malik, Tul,iMadan, S.Chand . & company.
8.Inorganic Chemistry, by James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi

9. 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. III Year (VI Semester)

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 33(10+23)**
Subject : Organic Chemistry **Paper Code : CH-304**

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

Heterocyclic Compounds-I: Introduction, Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

UNIT-II

Heterocyclic Compounds-II: Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline**.**

Organosulphur Compounds: Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyland aryl sulphonates.

UNIT-III

Organic Synthesis *via* Enolates: Acidity of hydrogens, alkylation of diethyl malonate and ethylacetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, and Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy re sins and polyurethanes. Natural and synthetic rubbers.

UNIT-IV

Amino Acids, Peptides& Proteins: Classification, of amino acids. Acid-base behavior, isoelectricpoint and electrophoresis. Preparation of α-amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective

hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.

Suggested Books:

1. Sykes, P. A Guidebook to Mechanism in Organic Chemistry 6th Ed., Prentice-Hall (1996).
2. Finar, I. L. &Finar, A. L. Organic Chemistry Vol. 2, Addison-Wesley (1998).
3. Finar, I. L. Organic Chemistry Vol. 1, Longman (1998).
4. Natural Products, their chemistry and biological significance. J. Mann, R. S. Davidson,

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Chemistry

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 34(10+24)**

Subject : Physical Chemistry **Paper Code : CH-306**

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 4.5 marks each*

UNIT-I

Spectroscopy-III: -Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respective transitions.

UNIT-II

Photochemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

UNIT-III

Solutions: -Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raolut'slaw, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

UNIT-IV

Phase Equillibrium: Statement and meaning of the terms- phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component System, water and Sulpher systems. Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic, Pb-Ag system, desilverisation of lead

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

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Chemistry

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

B. Sc. III Year (VI Semester)

Schedule per week Practical : 6 Hrs
Examination Time : 4 Hrs **Maximum Marks: 50(30+20)**
Subject : Chemistry Lab-VI **Paper Code : CH-308**

UNIT-I (Inorganic Chemistry)

Semimicro qualitative analysis of mixture containing not more thanfour radicals (including interfering, Combinations and excludinginsoluble's):
NH^{4+},CO_3^{2-}, S^{2-}, SO_3^{2-}, $S_2O_3^{2-}$, NO_2^-, CH_3COO^-, Cl^-, Br^-, I^-,NO_3^-, SO_4^{2-},$C_2O_4^{2-}$, PO_4^{3-}, BO_3^{3-}

UNIT-II (Physical Chemistry)

1. To determine the strength of given acid solution (mono and dibasic acid)/$KMnO_4$ – Mohr salt potentiometrically.
2. To determine the molecular weight of a non-volatile solute by Rastmethod.
3. To standardize the given acid solution (mono and dibasic acid) pH metrically.

UNIT-III (Organic Chemistry)

Synthesis of the following organic compounds:

(a) To prepare o-chlorobenzoic acid from anthranilic acid.
(b) To prepare p-bromoaniline from p-bromoacetanilide.
(c)To prepare m-nitroaniline from m-dinitrobenzene.
(d) To prepare S-Benzyl-iso-thiouronium chloride from thiourea

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. 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, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 3 Hrs
Examination Time : 3 Hrs Maximum Marks: 50(20+30)
Subject : Atomic, Molecular and Laser Physics Paper Code : PHY-302

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

Brief review of early models of atomic structure. Hydrogen atom spectrum and the Bohr model. Franck-Hertz experiment. The reduced mass and the discovery of the hydrogen isotopes. Correspondence principle, spectra of hydrogen-like atoms, magnetic moment due to orbital motion, normal Zeeman effect and limits of Bohr Sommerfield theory.

UNIT-II

Quantum mechanics applied to the hydrogen atom problem:Stern-Gerlach experiment and electron spin, spin orbit coupling, Fine structure of the hydrogen atom spectrum.

UNIT-III

Many-electron atoms: Hund's rule and the periodic table, spectral terms, doublet structure of alkali spectra. The effective quantum number and quantum defect, penetrating and non-penetrating orbits. Anomalous Zeeman effect, Paschen- Bach effect, Stark effect in hydrogen.

UNIT-IV

Rotational and Vibrational Spectroscopy: diatomic molecule as a rigid rotator, effect of isotopic substitution, non-rigid rotator. Vibrational energy of a molecule, diatomic molecule as a simple harmonic oscillator. The anharmonic rotator, Rotational- Vibrational Spectra, population of energy levels. Electronic spectra of molecules, dissociation, Frank-Condon principle. Raman effect: Lasers: Brief introduction to the principle of lasers. Energy level diagram of Laser (He-Ne). Relation of Einstein's coefficient. Threshold condition of laser formation.

Reference Books:

1. Introduction of atomic spectra: white
2. Atomic molecular physics by Rajkumar.
3. Lasers – Theory and Applications" by K. Thyagrajan and A.K. Ghatak
4. Physics of Atoms and Molecules" by Bransden and Joachain

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 3 Hrs
Examination Time : 3 Hrs Maximum Marks: 50(20+30)
Subject : Nuclear Physics Paper Code : PHY-304

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

Nuclear Structure and Properties of Nuclei: Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept). Determination of mass by Brain-Bridge, Brain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law. Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability

UNIT-II

Nuclear Radiation decay Processes: Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energy of beta-decay. Nature of gamma rays, Energetics of gamma rays. Radiation interaction Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles. Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of Beta particle, absorption of beta-particles. Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application.

UNIT III

Nuclear Accelerators: Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators. Synchrotron radiation . Nuclear Radiation Detectors.

Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector. CCD

UNIT-IV

Nuclear reactions: Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration,Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold. Nuclear Reactors. Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors, (Principle, construction, working and use).

References:

1. Kaplan I, Nuclear Physics, 2nd Ed (1962), Oxford and IBH, New Delhi
2. Sriram K, Nuclear Measurement Techniques, (1986), AEWP, New Delhi
3. Tayal D C, Nuclear Physics (1994), HPH, Bombay
4. Ghoshal S N, Atomic and Nuclear Physics Vol II (1994), S Chand & Co New Delhi
5. Srivastava B N, Basic Nuclear Physics, (1993), Pragati Prakashan Meerut
6. Halliday, Introductory Nuclear Physics, Asia Publishing House, New Delhi
7. Sood D D, Ready A V R and Ramamoorthy, Fundamentals of Radiochemistry, IANCAS (2007), BARC, Bombay
8. Cohen B L, Comcepts of Nuclear Physics (1998), Tata Mc Graw Hill, New Delhi
9. Krane K S, Introductory Nuclear Physics (1988), John Wiley & Sons New Delhi
10. Patel S B, Nuclear Physics (1992), Wiley Eastern Ltd, New Delhi
11. Roy R R and Nigam B P, Nuclear Physics (1993), Wiley Eastern Ltd New Delhi.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2015

B. Sc. III Year (VI Semester)

Schedule Per Week Practical : 6 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Physics Lab-VI (Seminar& project) **Paper Code : PHY-306**

Students need to perform minimum two experiments from each section and in total eight experiments.

Activities:

1. Demonstrations

(Any four demonstrations equivalent to two experiments)

(i) Electromagnetic induction by using two coils
(ii) Magnet –magnet interaction
(iii) Study of Collision by using balls
(iv) Study of Signal generator using CRO (Sine, square wave signal, measurement of AC voltage, frequency)
(v) Demonstration of action potential
(vi) Moment of inertia effect on rotation

2. Computer aided demonstrations (Using computer simulations or animations)

(Any two demonstrations equivalent to two experiments)
(i) Coulomb's law
(ii) Vectors: visualization of vectors
(iii) Bohr's model
(iv) Carnot engine, diesel engine
(v) Graphs and their slopes, and Kinematics graphs (using computer simulations)
(vi) Model of SC, BCC, FCC, and HCP crystals.

3. **Mini projects/Hand on activities**
(Any one equivalent to two experiments)

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Complex Analysis **Paper Code : MA-302**

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

Function of a complex variable, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions, orthogonal system.

UNIT-II

Mappings by elementary functions: Translation, rotation, Conformal Mappings, Mobius transformations, Fixed pints, Cross ratio, Inverse Points and critical mappings, Conformal transforms.

UNIT-III

Complex integration, Line integral, Cauchy's fundamental theorem, Cauchy's integral formula, Morera's theorem, Liouville theorem, Maximum Modulus Theorem, Taylor and Laurent series.

UNIT-IV

Singularities and zeros of an analytic function, Rouche's theorem, Fundamental theorem of algebra, Analytic continuation.

References:

1. A. R. Vasishtha, J.N. Sharma, A. K. VasishthaComplex AnalysisKrishna Prakashan Media
2. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
3. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
4. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi**.**

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Linear Algebra **Paper Code : MA-304**

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 spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

UNIT-II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensionalvector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

UNIT-III

Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular andnon-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

UNIT-IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements,Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram - Schmidt, Orthogonalization process.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
3. VivekSahai and VikasBist : Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
5. A. R. Vasishtha, J.N. Sharma, A. K. VasishthaLinearAlgebra,Krishna Prakashan Media

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

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

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Numerical Analysis **Paper Code : MA-306**

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

Finite Differences operators and their relations. Finding the missing terms and effect of error ina difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

UNIT-II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

UNIT-III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one- third and three-eighth rule, Weddle's rule, Chebychev formula, Gauss Quadrature formula.

UNIT-IV

Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2nd Edition).

6. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York.
7. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981.
8. Radhey S. Gupta: Elements of Numerical Analysis, Macmillan Publishing Co.

Gupta and Malik, Numerical AnalysisKrishna Prakashan Media
