



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

Schedule per week Lectures	: 2 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 33(10+23)
Subject	: Inorganic Chemistry	Paper Code : CH-201

**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**

**Chemistry of Elements of I transition series:** Definition of transition elements, position in the periodic table, General characteristics & properties of I transition elements, Structures & properties of some compounds of transition elements-TiO<sub>2</sub>, VOCl<sub>2</sub>, FeCl<sub>3</sub>, CuCl<sub>2</sub> and Ni (CO)<sub>4</sub>

**UNIT-II**

**Chemistry of Elements of II<sup>nd</sup> & III<sup>rd</sup> transition series:** General characteristics and properties of the II<sup>nd</sup> and III<sup>rd</sup> transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry

**UNIT-III**

**Coordination Compounds:** Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

**UNIT-IV**

**Non-aqueous Solvents:** Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH<sub>3</sub> and liquid SO<sub>2</sub>

**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 B.Sc. -II, by Ramesh Kapoor and R S Chopra, R. Chand .& company.



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

Schedule per week Lectures	: 2 Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 33(10+23)	
Subject	: Organic Chemistry	Paper Code	: CH-203

**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

**Alcohols:** Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, Acidic nature, Reactions of alcohols, Dihydric alcohols- nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [ $\text{Pb}(\text{OAc})_4$  and  $\text{HIO}_4$ ] and pinacol-pinacolone rearrangement.

**Epoxides:** Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides

#### UNIT-II

**Phenols:** Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of peroxide ion. Reactions of phenols- electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

#### UNIT-III

**Ultraviolet (UV) absorption spectroscopy:** Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward-Fieser rules, calculation of  $\lambda_{\text{max}}$  of simple conjugated dienes and -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

#### UNIT-IV

**Carboxylic Acids & Acid Derivatives:** Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, inter-conversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic)



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

**Schedule per week Lectures: 2 Hrs**

**Examination Time : 3 Hrs**

**Maximum Marks: 34(10+24)**

**Subject**

**: Physical Chemistry**

**Paper Code**

**: CH-205**

***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**

**Thermodynamics-I:** Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.

**UNIT-II**

**Thermodynamics-II:** Joule's law, Joule Thomson coefficient for ideal gas and real gas: and inversion temperature. Calculation of  $w$   $q$   $dU$  &  $dH$  for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications of bond energies.

**UNIT-III**

**Chemical Equilibrium:** Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applications Clapeyron equation and Clausius-Clapeyron equation its applications.

**UNIT-IV**

**Distribution Law:** Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium triiodide complex and process of extraction.

**Suggested Books:**

1. Physical Chemistry for B. sc. Students by S C Khetarpal, R. Chand & Co, New Delhi
2. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Pub.
3. Physical Chemistry, G.W. Castellan, Narosa. Publishers, New Delhi
4. Physical Chemistry, P.W. Atkins, Oxford University Press.
5. Thermodynamics for Chemists, S. Glasstone, Affiliated East-West Press.
6. Chemical Thermodynamics, I.M. Klotz and R.M. Rosenberg, Benzamin.



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Schedule per week Practical	: 6Hrs	
Examination Time	: 4 Hrs	Maximum Marks: 50(30+20)
Subject	: Chemistry Lab-III	Paper Code : CH-207

**UNIT-I(Inorganic)**

**1. Gravimetric Analysis**

Quantitative estimations of,  $\text{Cu}^{2+}$  as copper thiocyanate and  $\text{Ni}^{2+}$  as Ni – dimethylglyoxime.

**2. Colorimetry:**

To verify Beer - Lambert law for  $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$  and determine the concentration of the given  $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$  solution.

**UNIT-II(Physical)**

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the H of the dissolution process.

**UNIT-III (Organic)**

**Laboratory Techniques**

**(a) Steam distillation** (non evaluative) Naphthalene from its suspension in water  
Separation of *o*- and *p*-nitrophenols

**(b) Column chromatography** (non evaluative) Separation of fluorescein and methylene blue  
Separation of leaf pigments from spinach leaves

**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

**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.



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

Schedule per week Lectures	: 3	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Thermodynamics	Paper Code : PHY-201

*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**

**Kinetic theory of gases -I:** Assumption of Kinetic theory of gases, pressure of an ideal gas (no derivation), Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion( Qualitative)

**UNIT -II**

**Kinetic theory of gases -II:** Maxwell's distribution of speed and velocities (derivation required), Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases.

**UNIT-III**

**Thermodynamics-I:** Second law of thermodynamics and statements, Carnot theorem, Absolute scale of temperature, Absolute Zero, Derivation of Clausius-Clapeyron and Clausius latent heat equation, Entropy, T-S diagram, Nernst heat law, Clausius theorem, Calculations of entropy of reversible and irreversible processes, Development of Maxwell thermodynamical.

**UNIT-IV**

**Thermodynamics-II:** Thermodynamic function: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, Application of Maxwell relations in the derivation of relations between entropy, specific heats and thermodynamic variables, Phase diagram and triple point of a substance, Joule's free expansion, Joule-Thomson (Porous plug) experiment, Joule Thomson effect, Liquefaction of gases, (air, hydrogen, helium), Solidification of He below 4K, Cooling by adiabatic demagnetization.

**Text Books:**

1. Thermal Physics, by SC GARG, RAM BANSAL, CK GHOSH TMH Publication

2. Roy S K, Thermal Physics and Statistical Mechanics, New Age International Publishers, New Delhi

**Reference books:**

3. Sharma J K and Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House, Bombay
4. Stowe Keith, Introduction to Thermodynamics and its Applications, University press (India) Pvt Ltd, Hyderabad
5. Infelta Pierre P. Introductory Thermodynamics Publisher: Brown Walker Press
6. Johnson J. K, **Fundamentals of Thermodynamics** University of Pittsburgh 2009 Jefferson Tester, Michael Modell, Thermodynamics and Its Applications 3rd Edition.



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

Schedule per week Lectures	: 3 Hrs	
Examination Time	: 3 Hrs	Maximum
Marks: 50(20+30)		
Subject	: Optics-I	Paper Code : PHY-203

*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**

**Interference I:** Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determination of wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-prism and Lloyd mirror fringes, phase change on reflection.

**UNIT - II**

**Interference II:** Interference by Division of Amplitude: Thin film, Plane parallel film, Interference due to transmitted light, wedge shaped film, Newton's rings. Interferometers: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength.

**UNIT- III**

**Diffraction I:** Huygen's-Fresnel's theory, Fresnel's assumptions, rectilinear propagation of light, Fresnel's half-period zones, zone plate, diffraction at a straight edge, rectangular slit and diffraction at a circular aperture, Diffraction due to a narrow slit and diffraction due to a narrow wire.

**UNIT -IV**

**Diffraction II:** Fraunhofer diffraction: one-slit diffraction, two slit diffraction, N-slit diffraction, plane transmission grating spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating.

**Text Book-** 1. Introduction to Optics by Khanna and Gulati, R.Chand

- Reference Book-**1. Hecht, Optics, Pearson Education, New Delhi  
2. Brooker G, Modern Classical Optics, Ane Books Pvt Ltd, New Delhi  
3. Chaudhuri R N, Waves and Oscillations, New Age International Publishers, New Delhi  
4. Khandelwal D P, Text Book of Optics and Atomic Physics, Himalaya Publishing House, Bombay

5. Subrahmanyam N, Lal B, Avadhanulu M N, A Text Book of Optics, S Chand & Co,



## RAFFLES UNIVERSITY, NEEMRANA, ALWAR

### SCHOOL OF SCIENCE

#### Department of Physics

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

B. Sc. II Year (III Semester)

Schedule per Week Practical : 6 Hrs

Examination Time : 3 Hrs

Maximum Marks: 50(20+30)

Subject : Physics Lab-III

Paper Code : PHY-205

**Any ten program from given list of program are required to complete.**

1. To print out all natural (even/odd) numbers between given limits using computer.
2. To evaluate sum of finite series.
3. Write a program to find the average any ten numbers.
4. Write a program to calculate (i) Area of triangle (ii) area and perimeter of circle (iii) Area and volume of sphere
5. To find maximum, minimum and range of a given set of numbers using computer.
6. To find the largest number among the three numbers.
7. Write a program to calculate the first and second position among ten students in a class.
8. Find the roots of a quadratic equation.
9. Given values for a, b, c and d and a set of values for the variable x evaluate the function defined

by  $f(x) = ax^2 + bx + c$  if  $x < d$

$f(x) = 0$  if  $x = d$

$f(x) = ax^2 + bx - c$  if  $x > d$  For each value of x and print the value of x and f(x). Write a program for an arbitrary number of x values.

10. Write a program for increment in any number up to 10<sup>th</sup> position.
11. Write a program to operate mathematical loop from three numbers
12. Write program to construct a matrix of order (i) 2x3 column wise (ii) 2x3 row wise (iii) 3x3 row wise
13. Write a program to compute product of two matrices A and B of different dimensions. Illustrate the use of subscripted variable and implied Do loops.





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

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: <b>Advanced Calculus</b>	Paper Code	: <b>MA-201</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**

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives.

**UNIT-II**

Limit and continuity of real valued functions of two variables. Taylor's theorem for functions of two variables. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

**UNIT-III**

Reduction formula, Beta and Gamma function and Envelopes.

**UNIT-IV**

Quadrature, Rectification, Volume and surface of solids of revolution, Pappus theorem, double and triple integrals, Change the order of integration, Dirichlet's integral.

**Books Recommended:**

1. C.E. Weather burn: Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
2. Gabriel Klaumber : Mathematical analysis, MrcelDekkar, Inc., New York, 1975
3. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
4. GorakhPrasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
8. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Advanced Calculus Krishna Prakashan Media



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**Department of Mathematics**  
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**B. Sc. II Year (III Semester)**

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Partial Differential Equations	Paper Code	: MA-203

**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**

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

**UNIT-II**

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant co-efficient, Partial differential equation with variable co-efficient reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

**UNIT-III**

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

**UNIT-IV**

Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

**Books Recommended:**

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India),1967
2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill BookCompany, 1988

5. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill BookCompany, 1972
6. J.N. Sharma & Kehar Singh : Partial Differential Equations



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

Schedule per week Lectures	: 2Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Statics	Paper Code	: MA-205

**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**

Common Catenary, Parallel forces. Moments and Couples.

**UNIT-II**

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

**UNIT-III**

Virtual work. Forces in three dimensions. Poinso's central axis.

**UNIT-IV**

Wrenches. Null lines and planes. Stable and unstable equilibrium.

**Books Recommended:**

1. S.L. Loney : Statics, Macmillan Company, London
2. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Computer Science**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. I Year (III 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>: Computer Fundamentals</b>	<b>Paper Code</b>	<b>: COM-201</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 6 marks each.

**UNIT-I**

**Computer Fundamentals:** Definition, Block Diagram along with its components, characteristics & classification of computers. Evolution of Computers - Generations, Types of computers, Computer system characteristics, Basic components of a Digital Computer - Control unit, ALU, Input/output functions and memory

**UNIT-II**

Computer Software and Hardware, relationship between hardware and software, Software and Types of Software, Programming Languages- Machine Language, Assembly Language, High Level Language, Object Oriented Language. Techniques of Problem Solving: Flowcharting, algorithms, pseudo code, decision table, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

**UNIT-III**

Number Systems & Arithmetic Number System: Positional, Non-positional, binary, octal, decimal, hexadecimal and their representation; Methods of conversion from one base to another; Unsigned, Signed, 1's Complement, 2's Complement, Binary Arithmetic: Fixed & Floating point numbers, representation, errors, overflow, underflow.

**UNIT-IV**

Memory - RAM, ROM, EPROM, PROM and other types of memory, Storage fundamentals - Primary Vs Secondary Data Storage, Various Storage Devices - Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks (Winchester Disk), Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive, flash drives Video Disk, Blue Ray Disc, SD/MMC Memory cards, DVD, DVD-RW, USB Pen drive.

**Reference Books:**

1. S.K.Basandra, "Computers Today ", Galgotia Publications.
2. Computer Fundamentals – P. K. Sinha – BPB Publication
3. PC Software – Shree SaiPrakashan, Meerut
4. Computer Fundamentals – B. Ram – New Age International Publishers.



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

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

**Chemistry of f-block elements:**

**Lanthanides:** Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

**UNIT-II**

**Chemistry of f-block elements**

**Actinides:** General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

**UNIT-III**

**Theory of Qualitative and Quantitative Inorganic Analysis-I:**

Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

**UNIT-IV**

**Theory of Qualitative and Quantitative Inorganic Analysis-II:**

Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co-precipitation, Post-precipitation, purification of precipitates.

**Suggested Books:**

1. Inorganic Chemistry, by Malik, Tulli, Madan, S. Chand . & company.
2. A text book of Inorganic Chemistry, O P Tandon, G R Bathla Pulication 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. -IV, by Ramesh Kapoor and R S Chopra, R. Chand. & company.



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

<b>Schedule per week Lectures</b>	<b>: 2Hrs</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</b>	<b>: CH-204</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 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**

**Infrared (IR) absorption spectroscopy:** Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

#### **UNIT-II**

**Amines:** Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

#### **UNIT-III**

**Diazonium Salts:** Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO<sub>2</sub> and CN groups, reduction of diazonium salts to hydrazines, coupling reaction and its synthetic application.

**Nitro Compounds:** Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitroarenes and their reductions in acidic, neutral and alkaline medium.

#### **UNIT-IV**

**Aldehydes and Ketones:** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridiniumchlorochromate (PCC) and pyridiniumdichromate., Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction.

Mannich reaction. Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  reductions.



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

Schedule per week Lectures	: 2 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 34(10+24)
Subject	: Physical Chemistry	Paper Code : CH-206

**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**

**Thermodynamics-III:** Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy— entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

**UNIT-II**

**Thermodynamics-IV:** Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

**UNIT-III**

**Electrochemistry-III:** Electrolytic and Galvanic cells, reversible & Irreversible cells, conventional representation of electrochemical cells, EMF of cell and its measurement, Weston standard cell, activity and activity coefficients, Calculation of thermodynamic quantities of cell reaction (G,H& K).Types of reversible electrodes metal-metal ion gas electrode, metal–insoluble salt anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.

**UNIT-IV**

**Electrochemistry-IV:** Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration(acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.

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

<b>Schedule per week Practical</b>	<b>: 6 Hrs</b>	
<b>Examination Time</b>	<b>: 4 Hrs</b>	<b>Maximum Marks: 50(30+20)</b>
<b>Subject</b>	<b>: Chemistry Lab-IV</b>	<b>Paper Code : CH-208</b>

**UNIT-I (Inorganic Chemistry)**

**Preparations:** Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

**UNIT-II (Physical Chemistry)**

1. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
2. To determine the enthalpy of solution of solid calcium chloride
3. To study the distribution of iodine between water and CCl<sub>4</sub>.

**UNIT-III (Organic Chemistry)**

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, *p*-dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol, hydroquinone,  $\alpha$ -naphthol,  $\beta$ -naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicylic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, *p*-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p* nitroanilines, 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, Edward 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, Pragati Prakasan



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

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

**Statistical Physics-I:** Probability and probability theorem, some probability considerations, combinations possessing maximum probability, combinations possessing minimum probability, Micro-Macro states, Constraints, Accessible states, Ensembles, Thermodynamical probability, general distribution of particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact,  $\beta$  parameter, Entropy and Probability, Boltzmann distribution law.

**UNIT - II**

**Statistical Physics II:** Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics, M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of  $\alpha$  and  $\beta$ ), speed distribution law & velocity distribution law. Expression for average speed, r m s speed, average velocity, r m s velocity, most probable energy & mean energy for Maxwellian distribution.

**UNIT -III**

**Quantum Statistics:** Classical verses Quantum Statistics: Identical particles, Bose-Einstein Statistics, Application of B.E Statistics of Planck's radiation law, B.E. gas, M. B. Law as a limiting case of B.E. Degeneracy and B.E. Condensation.

**UNIT-IV**

**Theory of Specific Heat of Solids:** Fermi-Dirac statistics, F.D. gas, electron gas in metals, Zero point energy, Specific heat of metals and its solution. Dulong and Petit law, Specific heat at low temperature, Einstein theory of specific heat, Debye model of specific heat of solids,

**Reference Book:**

1. Prakash S and Agarwal J P, Statistical Mechanics, Kedar Nath Ram Nath & co, Meerut.
2. Reif F, statistical Physics, Berkeley Physics Course Volume 5, Mc Graw Hill Book Co Ltd, New Del hi.



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

Schedule per week Lectures	: 3 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Optics - II	Paper Code : PHY-204

*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**

**Polarization:** Polarization and Double refraction, Polarization by reflection, Polarization by scattering, Malus Law, Phenomenon of double refraction, Huygens wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of rotation, Specific rotation, Polarimeters (half shade and Bi-quartz).

**UNIT-II**

**Fourier analysis:** Fourier series, Fourier coefficients, odd functions, even functions, Fourier theorem, analysis of complex waves and its application for the solution of triangular and rectangular waves, half and full wave rectifier outputs.

**UNIT III**

**Fourier transforms:** Fourier transforms and its properties, Application of Fourier transform. Fourier sine transforms. Fourier cosine transform.

**Holography:** Holography versus photography, Basic theory of holography, Basic requirement of a holographic laboratory; Applications of holography in microscopy and interferometry.

**UNIT-IV**

**Fiber Optics:** Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages.

**Reference Book:**

- 1 Born M and Wolf E, Principles of Optics, Pergaman Press
- 2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New Delhi

- 3 Moller K D, Optics, University Science Books, Mill ally California  
4 Tolansky, An Introduction to Interferometry, John Wiley & Sons, New Delhi  
5 Shurcliff, Polarized Light Production and Use, Harward University Press, Cambridge, M A (USA)



**RAFFLES UNIVERSITY, NEEMRANA, ALWAR**  
**SCHOOL OF SCIENCE**  
**Department of Physics**  
**(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)**  
**B. Sc. II Year (IV 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-IV</b>	<b>Paper Code</b>	<b>: PHY-206</b>

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

1. Verification of Newton's Ring formula and determination of wavelength of sodium light.
2. Determination of Magnifying and Resolving power of a telescope.
3. Refractive Index and Dispersive Power of a Prism using spectrometer.
4. Determine wavelength of light using plane transmission diffraction grating.
5. Determine resolving power of a grating.
6. Specific Rotation of Sugar solution by Laurent's half-Shade Polarimeter.
7. To determine numerical aperture of the optical fiber
8. Wavelength of Sodium light by Fresnel's Biprism.



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

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

Linear programming problems, Statement and formation of general linear programming problems, Graphical method, slack and surplus variables, standard and matrix forms of linear programming problem, Basic feasible solution.

**UNIT-II**

Transportation problems, Assignment problems.

**UNIT-III**

Fundamental theorem of linear programming, simplex method Artificial variables, Big-M method, Convex sets.

**UNIT-IV**

Duality in linear programming problems, Dual simplex method, Primal-dual method.

**Books Recommended:**

1. J.K Sharma Operations Research: Theory and Applications 5th Edition (English) 5th Edition Laxmi Publications New- Delhi
2. V. K Kapoor Operations Research: Sultan Chand and Sons
3. S.D Sharma Operations Research Publisher Kedar Nath Ram Nath
4. R. K Gupta linear programming 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. II Year (IV Semester)**

Schedule per week Lectures	: 2Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: <b>Special Functions</b>	Paper Code : MA-204
	: <b>and Integral Transforms</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**

Series solution of differential equations -Power series method, Definitions of Beta and Gammafunctions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions

**UNIT – II**

Legendre and Hermite differentials equations and their solutions: Legendre and Hermitefunctions and their properties-Recurrence Relations and generating functions. Orthogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

**UNIT-III**

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem.

**UNIT-IV**

Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, change the scale property and Shifting theorems for inverse Laplace, solution of ordinary differential equations using Laplace transform. Finite Fourier transforms, Infinite Fourier transforms, Fourier integral, Application of Fourier transform to boundary value problems,

**Books Recommended:**

1. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
2. Murray R. Spiegel: Laplace transforms, Schaum's Series.
3. S. S Seth Integral Transforms: Students' Friends & Company
4. I.N. Sneddon: Special Functions on mathematics, Physics & Chemistry.

5. W.W. Bell: Special Functions for Scientists & Engineers.



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

Schedule per week Lectures	: 2Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Programming in C and Numerical Methods	Paper Code : MA-206

**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**

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions.

**UNIT-II**

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.

**UNIT-III**

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions. Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods.

**UNIT-IV**

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

**Books Recommended:**

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994

3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw -Hill Publishing Co. Ltd., 1998
4. M.K. Jain, S.R.K.Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
8. Gupta and Malik, Numerical Analysis Krishna Prakashan Media
9. Babu Ram: Numerical Methods, Pearson Publication.
10. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.



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

<b>Schedule per week Lectures</b>	<b>: 2Hrs</b>	
<b>Examination Time</b>	<b>: 2Hrs</b>	<b>Maximum Marks: 50(20+30)</b>
<b>Subject</b>	<b>: Computer Lab</b>	<b>Paper Code : COM-202</b>

**List of Practical's**

1. MS-Windows: Basics of Windows, Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders.
  2. Control panel – display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows accessories.
  3. Documentation Using MS-Word -Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary,
  4. Page Formatting, Bookmark, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.
  5. Electronic Spread Sheet using MS-Excel - Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts,
  6. Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation.
  7. Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art,
  8. Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.
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