Syllabus

CHM-63T-201: Chemistry of s, p-block elements and Noble Gases, Non-aqueous Solvent, Nuclear Chemistry, Hydrocarbons and Alkyl halide, Fundamentals of Thermodynamics, Solutions and their Colligative Properties.

Unit-I

s-Block Elements: Comparative study of properties of alkaline and alkaline earth metals, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.

Periodicity of p-block elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron-affinity, electronegativity, diagonal relationship, catenation.

Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of Xenon, structure and bonding in Xenon compounds.

15 Lecture

Unit-II

Oxidation and Reduction:
Uses of Redox Potential data, analysis of redox cycle, redox stability in water. Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

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_3 and liquid SO_2

Nuclear Chemistry: Fundamental particles of nucleus (nucleons), concept of nuclides and its representation, Isotopes, Isobars and Isotones (with specific examples), forces operating between nucleons (n-n, p-p & n-p), Qualitative idea of stability of nucleus (n/p ratio).
Radioactive elements chemistry: Natural and artificial radioactivity, Radioactive disintegration series, Radioactive displacement law, Radioactivity decay rates, Half-life and average life, Nuclear binding energy, mass defect and calculation of defect and binding energy, Nuclear reactions, Spallation, Nuclear fission and fusion. Brief discussion on Atom bomb, Nuclear reactor and Hydrogen bomb.

15 Lecture

Unit-III

Alkanes and Cycloalkanes: Free radical halogenations of Alkanes: mechanism, orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Theory of strainless rings.
Alkenes, Cycloalkenes, Dienes and Alkynes: Relative stabilities of alkenes. Chemical reactions of alkenes - hydroboration-oxidation, oxymercuration-reduction. Epoxidation, ozonolysis and oxidation with $KMnO_4$. Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.
Classification and Nomenclature of isolated, conjugated and cumulated dienes. Structure of allenes and butadiene. Methods of formation, properties and chemical reactions - 1,2- and 1,4-additions, Diels-Alder reaction and polymerization reactions.
Structure and bonding in alkynes. Methods of formation. Chemical reactions - acidity of alkynes: mechanism of electrophilic and nucleophilic addition reactions; hydroboration-oxidation; metal-ammonia reduction, oxidation and polymerization.

Alkyl Halides: Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

15 Lecture

Unit- IV

Thermodynamics - I
Definition of Thermodynamic Terms: System, surroundings, etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process, concept of heat and work.
First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of Ideal gases under isothermal

and adiabatic conditions for reversible process.

Thermochemistry:

Standard state, standard enthalpy of formation, Hess's law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

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, Raoult's law, relative lowering of vapor pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression in freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

15 Lecture

Suggested Books and References:

1. Concise Inorganic Chemistry by J.D. Lee, Wiley, India.
2. Inorganic Chemistry by Housecroft, E. Catherine & Sharpe, G Alan, Pearson Education Ltd.
3. Advanced Inorganic Chemistry by G. D. Tuli, S. Chand, New Delhi.
4. Advanced Inorganic Chemistry by Satya Prakash, S. Chand, New Delhi.
5. Nuclear and Radiochemistry: Fundamental and Applications, 2 Vols., Jens-Volker Kratz and Karl Heinrich Lieser; 3rd Edn., John Wiley & Sons: UK, 2013.
6. Essentials of Nuclear Chemistry by H. J. Arnikar, Wiley, New York.
7. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Vishal Publishing Co.
8. Organic Chemistry by R. T. Morrison & R. N. Boyed, Prentice Hall
9. Organic Chemistry by I. L. Finar, (Vpl. I & II) ELBS
10. Reaction Mechanism in Organic Chemistry by S. M. Mukherji & S. P. Singh, Reaction Mechanism in Organic Chemistry by S. M. Mukherji & S. P. Singh, TRINITY Press.
11. Physical Chemistry by R. J. Silbey, R. A. Alberty & M. G. Bawendi, John Wiley & Sons.
12. Principles of Physical Chemistry by B. R. Puri, L. R. Sharma and M. S. Pathania, Vishal Publishing Co.
13. An Introduction to Chemical Thermodynamics by R. P. Rastogi & R. R. Mishra, Vikas Publishing House.
14. A Text Book of Physical Chemistry: A. S. Negi and S. C. Anand, New Age International Publishers.
15. Advanced Physical Chemistry by Gurdeep Raj, Goel Publishing House.
16. Elements of Physical Chemistry, P. Atkins and J. De Paula, Oxford.
17. A Textbook of Physical Chemistry, Application of Thermodynamics, by K. L. Kapoor, (Volume- 3) McGraw Hill.
18. An Introduction to Chemical Thermodynamics by R. P. Rastogi & R. R. Mishra, Vikas Publishing House.
19. Solutions, Phase Equilibrium, Conductance & Electrochemistry by Puri, Sharma, Pathania and Kaur, Vishal Publishing Co.

Suggested E-resources:

All the above suggested books are available as **e- books.**

Online Lecture Notes and Course Materials: Online Lecture Notes and Course Materials:

All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF), web page ,etc.

Syllabus

CHM-63P-202: Chemistry Lab III

(4 Hrs./week)

10 marks

Inorganic Chemistry

Gravimetric estimations: (Any three)

(a) Estimate zinc as zinc ammonium phosphate.
(b) Estimate lead as lead chromate.
(c) Estimate copper as cuprous thiocyanate.
(d) Estimate nickel as nickel dimethyl glyoximate.

10 marks

Organic Chemistry

Qualitative Analysis

(a) Identification of organic compounds (solids or liquids) through element detection (N, S and

halogens) melting /boiling points, functional group analyses with the preparation of suitable derivative. **(Any two)**

(b) One step organic synthesis containing: -

i. Acetylation

(a) Acetanilide from Aniline

(b). Aspirin from salicylic acid

ii. Reduction

(a) *m* -nitro aniline from *m* -dinitrobenzene.

(b) Anthrone by anthraquinone

iii. Electrophilic substitution Reactions

Nitration of nitrobenzene

Physical Chemistry **10 marks**

Distribution law

(a) To determine partition coefficient of iodine between water and $CCl_4/CHCl_3/CS_2$ at room temperature.

(b) To study the distribution of benzoic acid between benzene and water.

Chemical kinetics

(a) Determine the velocity constant and order of reaction for the hydrolysis of ethyl acetate by sodium hydroxide at room temperature (saponification of an ester).

Thermochemistry

(a) To determine heat of neutralization of given acid and base.

(b) To determine the dissociation energy of given weak acid.

Solution

(a) To determine the molecular mass of given non-volatile substance cryscopically.

Viva-voce **5 marks**

Practical Record **5 marks**

Suggested Books and References:

1. Advanced Practical Organic Chemistry by N K Vishnoi, Vikas Publishing House PVT LTD
2. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, V. K Ahluwalia. Universities Press, Hyderabad.
3. Advanced Practical Organic Chemistry by N K Vishnoi, Vikas Publishing House PVT LTD
4. Vogel's Qualitative Inorganic Analysis, A. I. Vogel Prentice Hall.
5. Vogel's Quantitative Inorganic Analysis Including Elementary Instrumental Analysis, ELBS.
6. Vogel's Textbook of Quantitative Chemical Analysis, A. I. Vogel, Pearson Education Ltd.
7. Laboratory Techniques in Organic Chemistry by V. K Ahluwalia, I K International, N
8. Advanced Practical Organic Chemistry J. B Yadav, Goel Publishing House.
9. Practical Physical Chemistry, by B. D Khosla, S. Chand & Company.

Suggested E-resources:

All the above suggested books are available as **e- books.**

Online Lecture Notes and Course Materials:

All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF),web page ,etc.

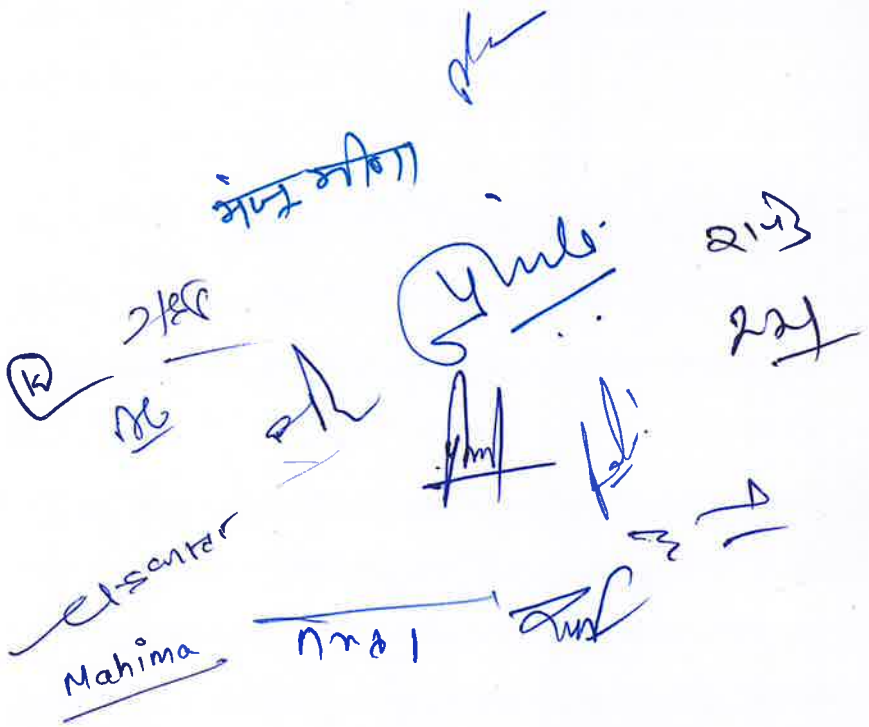
Course Learning Outcomes:

With the completion of this course, students will be able to understand concepts related to periodic trends of s and p-block elements their properties, applications along with noble gases. Student will gain knowledge about the uses of non-aqueous aprotic solvents in chemical research and the essentials of nuclear chemistry with their uses range from agricultural to medical and space exploration to water desalination. Moreover, the organic reactions of saturated and unsaturated hydrocarbons and their uses are incorporated to gain clear understanding in this field. Concepts related to the field of basic and applied thermodynamics and solutions with their colligative properties are also incorporated to enrich the knowledge in these fields,

By the end of this degree programme, student would have achieved the essential conceptual knowledge in the field of chemical sciences and will be able to conduct experiments and demonstrate efficiency with appropriate lab skills, techniques and instrumentations.

Syllabus
IV – Semester

CHM-64T-203- **Chemistry of d & f block elements, Chemistry of Oxygen/Nitrogen-Containing Functional Groups and Chemical and Ionic Equilibrium,**



Thermodynamics-II.

Unit-I

Chemistry of Elements of First Transition Series:
Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation-states, coordination number and geometry.
Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.
Chemistry of Lanthanide and Actinide Elements:
Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.
General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

15 Lecture

Unit-II

Alcohols - Classification and nomenclature.
Monohydric alcohols - Methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, Acidic nature. Reactions of alcohol with mechanism.
Dihydric alcohols - methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.
Trihydric alcohols - methods of formation, chemical reactions of glycerol.
Phenols
Nomenclature, structure and bonding. Preparation of Phenols. Physical properties and acidic character. Comparative acidic strength of alcohols and phenols. Reactions of phenols- electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gattermann synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.
Ethers and Epoxides
Methods of formation, physical properties. Chemical reactions - cleavage and autooxidation. Ziesel's method.
Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Aldehydes and Ketones
Structure of the carbonyl group. Syntheses of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, syntheses of ketones from nitriles and from carboxylic acids. Physical properties.
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 (Meervein-Pondrof-Verley), Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions, Halogenation of enolizable ketones. Use of acetals and 1,3-dithiane as protecting group.

15 Lecture

Unit-III

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.
Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids.
Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

Carboxylic Acid Derivatives
Structure, nomenclature and synthesis of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.
Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic).

Organic Compounds of Nitrogen
Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.
Amines: Structure, nomenclature and preparation of alkyl, and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Gabriel-phthalimide reaction and Hoffmann bromamide reaction with mechanism.
Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Diazotisation and mechanism. Synthetic transformations of aryl diazonium salts, azo coupling and its applications.

15 Lecture

Unit- IV

Thermodynamics –II
Second Law of Thermodynamics: Need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot-Theorem. Thermodynamic 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, Clausius inequality and entropy as a criteria of spontaneity and equilibrium. Entropy changes in ideal gases and mixing of gases.
Third Law of Thermodynamics: Nernst heat theorem, statement and 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.

Chemical Equilibrium:
Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction Isotherm and reaction isochore. Clapeyron equation and Clausius-Clapeyron equation, applications.
Ionic Equilibrium: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale,

common ion effect. Salt hydrolysis – calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product.

15 Lecture

Suggested Books and References:

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson, & P.L Gaus, Willey.
2. Concise Inorganic Chemistry by J. D. Lee, Wiley-India.
3. Inorganic Chemistry by Catherine E. Housecroft, & Alan G Sharpe, Pearson Education Ltd.
4. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Vishal Publishing Co.
5. Concise Coordination Chemistry by R. Gopalan and V. Ramalingam, Vikas Publishing House Pvt, Ltd.
6. Concepts and Models of Inorganic Chemistry, B.E. Douglas, D. McDaniel, & J. Alexander, Wiley.
7. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure by J March, & M. B Smith Wiley.
8. Organic Chemistry by R. T. Morrison & R. N. Boyed, Prentice Hall
9. Reaction Mechanism in Organic Chemistry by S. M. Mukherji & S. P. Singh, TRINITY Press.
10. Organic Chemistry by I. L. Finar, (Vol. I & II) ELBS.
11. Physical Chemistry by R. J. Silbey, R. A. Alberty & M. G. Bawendi, John Wiley & Sons.
12. Principles of Physical Chemistry by B. R. Puri, L. R. Sharma and M. S. Pathania, Vishal Publishing Co.
13. An Introduction to Chemical Thermodynamics by R. P. Rastogi & R. R. Mishra, Vikas Publishing House.
14. A Text Book of Physical Chemistry: A. S. Negi and S. C. Anand, New Age International Publishers.
15. Advanced Physical Chemistry by Gurdeep Raj, Goel Publishing House.
16. Elements of Physical Chemistry, P. Atkins and J. De Paula, Oxford.
17. A Textbook of Physical Chemistry, Application of Thermodynamics, by K. L. Kapoor, (Volume-3) McGraw Hill.
18. An Introduction to Electrochemistry by Samuel Glasstone, BSC Publishers.
19. Electrochemistry and its Applications by G. Whitmore, Sarup & Sons.
20. Physical Chemistry by G.M Barrow, Tata McGraw-Hill.
21. Fundamentals of Electrochemistry by Morris Sylvin, Sarup & Sons.
22. Solutions, Phase Equilibrium, Conductance & Electrochemistry by Puri, Sharma, Pathania and Kaur, Vishal Publishing Co.
23. Phase Equilibria, Phase Diagrams and Phase Transformations by Mats Hillert, Cambridge University Press
24. Textbook of Physical Chemistry, (Volume 5) by Kapoor, K. L Macmillan India Ltd.

Suggested E-resources:

All the above suggested books are available as **e- books.**

Online Lecture Notes and Course Materials: Suggested E-resources:

All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF),web page ,etc.

Syllabus

CHM-64P-204: Chemistry Lab IV — 4 Hrs./week

Inorganic Chemistry — **10 marks**

Inorganic Preparations

(a) Preparation of tetraamminecopper(II) sulphate
(b) Preparation of cis and trans-potassium diaquadioxalatochromate(III).
(c) Synthesis of sodium trioxalatoferrate(III).
(d) Preparation of bis(glyoxamato)nickel (II).

Organic Chemistry — **10 marks**

Organic Syntheses

(a) Synthesis of iodoform from ethanol and acetone (Aliphatic Electrophilic Substitution).
(b) Synthesis of aspirin from salicylic acid (Acetylation).
(c) Synthesis of phthalimide from phthalic anhydride.
(d) Synthesis of succinic anhydride.

Physical Chemistry — **10 marks**

Transition Temperature

(a) Determination of transition temperature of the given substance ($Na_2SO_4.10H_2O$, $MnCl_2.4H_2O$ or $SrBr_2.6H_2O$) by thermometric method.

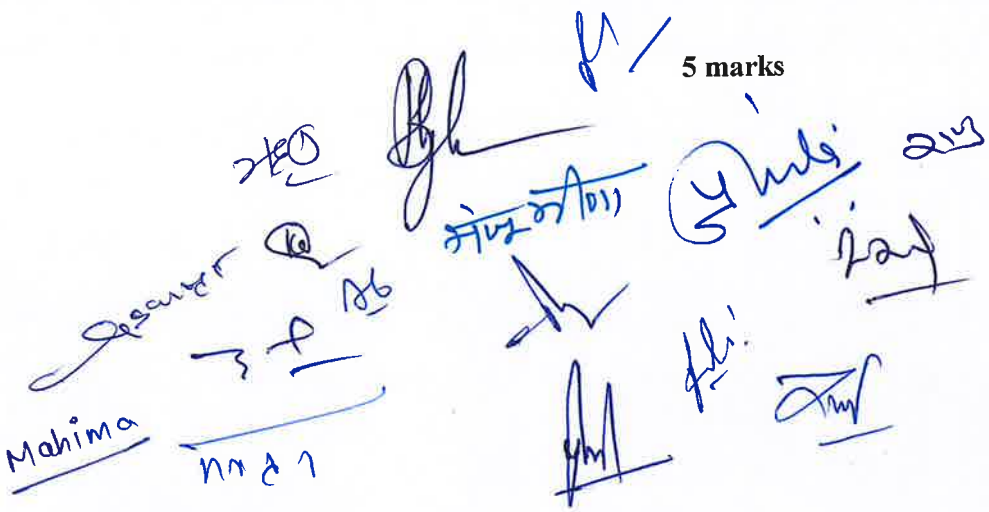
Phase Equilibrium

(a) To construct the phase diagram of two component system like phenol-H_2O system and determine the CST (critical solution temperature) and composition of the solution at CST.
(b) To study the effect of solute $NaCl$ and succinic acid etc. on the CST (critical solution temperature) of two partially miscible liquids (phenol-H_2O system) and determine the concentration of that solute in the given partially miscible liquid system.

Ionic Equilibrium

Preparation of different types of buffer solutions and determination of pH using pH meter.

Viva voce — **5 marks**



Practical Record **5 marks**

Suggested Books and References:

1. A. I. Vogel, Vogel's Qualitative Inorganic Analysis, Prentice Hall.
2. Vogel's Quantitative Inorganic Analysis Including Elementary Instrumental Analysis, ELBS.
3. Vogel's Textbook of Quantitative Chemical Analysis, A. I. Vogel, Pearson Education Ltd.
4. Advanced Practical Organic Chemistry by N K Vishnoi, Vikas Publishing House PVT LTD
5. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, V. K Ahluwalia. Universities Press, Hyderabad.
6. Laboratory Techniques in Organic Chemistry by V. K Ahluwalia, I K International, N
7. Advanced Practical Organic Chemistry J. B Yadav, Goel Publishing House.
8. Practical Physical Chemistry, by B. D Khosla, S. Chand & Company.

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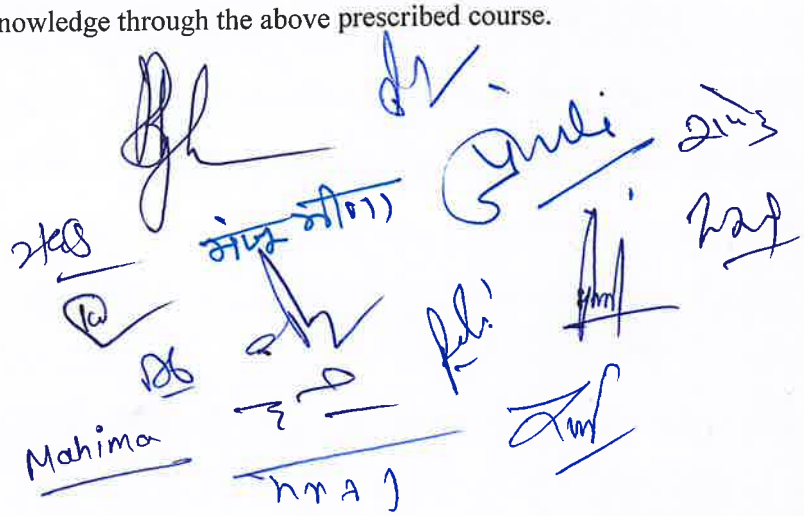
Online Lecture Notes and Course Materials:
All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF),web page ,etc.

Course Learning Outcomes:

With the completion of this degree programme, student will achieve the essential conceptual knowledge in the field of chemical sciences and will be able to conduct experiments and demonstrate efficiency with appropriate lab skills, techniques and instrumentations.

Student will be able to understand the theoretical knowledge about first, second and third series of transition metals, lanthanides and actinides chemistry with their periodic trends, properties and applications in various fields. In addition to the above, student will acquire knowledge about the characteristic organic reactions associated with O/ N-elements containing functional groups and their interconversion with their uses in synthetic organic chemistry. Moreover, chemical and ionic equilibrium and applied thermodynamics are incorporated to enrich student's conceptual knowledge through the above prescribed course.



Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-63T-211] - [Real Analysis-I & Differential Equations-I]
III-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0105-MAT-63T-211 Real Analysis-I & Differential Equations-I	1 Hrs-CA 3 Hrs-EoSE	20 Marks-CA 80 Marks-EoSE	08 Marks-CA 32 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
III	UG0105-MAT-63T-211	Real Analysis-I & Differential Equations-I			6	4
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
Introductory	UG	4	0	4	Lecture, Sixty Lectures	
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		Mathematics course of XII std. of Central Board of Secondary Education or equivalent.				
Objectives of the Course:		The primary objective of this course is to introduce the real number with algebraic, order, completeness properties, and convergence/ divergence of sequences. The course also offers the solution strategies to differential equations viz. Linear, homogeneous linear, linear equations with constant coefficients and allied types.				

Sita Meena

04/10

4/10/2024

साक्षी गुप्ता

4/10

Detailed Syllabus

[UG0105-MAT-63T-211] - [Real Analysis-I & Differential Equations-I]

Unit - I

Bounded set, Neighbourhood, Limit point, Bolzano-Weierstrass theorem, closed and Open sets. Concept of compactness and connectedness. Heine-Borel theorem.

(15 Lectures)

Unit - II

Real sequences- Limit and Convergence of a sequence, Monotonic sequences. Cauchy's sequences, Subsequences, Cauchy's general principle of convergence. Continuous functions: Properties of continuous functions on closed intervals.

(15 Lectures)

Unit -III

Exact differential equations and equations which can be made exact. First order but higher degree differential equations solvable for x, y and p. Linear differential equations with constant coefficients, Complementary function and Particular integral.

(15 Lectures)

Unit-IV

Homogeneous linear differential equations, Linear differential equations of second order. Solution by transformation of the equation by changing the dependent variable/the independent variable, Method of variation of parameters, Method of undetermined coefficients.

(15 Lectures)

Suggested Books and References –

1. Royden H, Fitzpatrick PM. Real analysis. China Machine Press; 2010.
2. Rudin W. Principles of mathematical analysis. New York: McGraw-hill; 1964.
3. Bartle RG, Sherbert DR. Introduction to real analysis. New York: Wiley; 2000.
4. Mapa SK. Introduction to Real Analysis. Sarat Book Distributors; 2014.
5. Malik SC, Arora S. Mathematical analysis. New Age International; 1992.
6. Ross SL, Differential Equation-Jhon Wiley & Sons. Inc. New York. 1984.
7. Raisinghania MD, Ordinary and partial differential equations. S. Chand Publishing; 2013.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials:**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Apply Bolzano-Weierstrass and Heine-Borel theorems to real number sets.
2. Test sequence convergence using Cauchy's principle and analyse continuous functions on closed intervals.
3. Solve first-order and higher-degree differential equations and linear differential equations with constant coefficients.
4. Solve second-order linear differential equations using transformation techniques and assess linear independence of solutions.

Sita Meena 04/10 4/10/2024

साक्षी गुप्ता 4/10

Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-63T-212] - [Mathematical Statistics]
III-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0105-MAT-63T-212 Mathematical Statistics	1 Hrs-CA 3 Hrs-EoSE	30 Marks-CA 120 Marks-EoSE	12 Marks-CA 48 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
III	UG0105-MAT-63T-212	Mathematical Statistics			6	6
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
Introductory	UG	6	0	6	Lecture, Ninety lectures	
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		Mathematics course of XII std. of Central Board of Secondary Education or equivalent.				
Objectives of the Course:		The main objective of this course is to introduce the theory underlying modern statistics to give the student a solid grounding in Mathematical Statistics.				

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Detailed Syllabus

[UG0105-MAT-63T-212] - [Mathematical Statistics]

Unit - I

Frequency distributions and measures of location, Measures of dispersion, Skewness and Kurtosis, Moments of frequency distributions.

(22 Lectures)

Unit - II

Theory of probability. Mathematical expectation, Moment generating and Cumulative functions.

(23 Lectures)

Unit -III

Discrete probability distributions (Binomial, Poisson, Geometric and Hypergeometric). Continuous probability distributions (Rectangular and Normal distributions).

(22 Lectures)

Unit-IV

Methods of least squares and curve fitting. Correlation and Regression.

(23 Lectures)

Suggested Books and References –

1. Gupta SC, Kapoor VK. Fundamentals of mathematical statistics. Sultan Chand & Sons; 2020.
2. Kapur JN, Saxena HC. Mathematical Statistics. S. Chand; 1976.
3. Meyer PL. Introductory probability and statistical applications. Oxford and IBH Publishing; 1965.
4. Spiegel MR, Srinivasan RA, Schiller JJ. Schaum's outline of theory and problems of probability and statistics. Erlangga; 2000.
5. Goon AM, Gupta MK, Dasgupta B. Fundamentals of Statistics. World Press Private Limited; 1975.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials:**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Analyse frequency distributions and measure central tendency, dispersion, skewness, and kurtosis.
2. Apply probability theory, mathematical expectation, and moment generating functions.
3. Use discrete and continuous probability distributions in practical scenarios.
4. Implement least squares, curve fitting, and correlation and regression techniques.

Gita Meena 04/10 4/10/2024

साक्षी गुप्ता

Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-63P-213] - [Introduction to Scilab: A Mathematical Tool]
III-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Practical	UG0105-MAT-63P-213 Introduction to Scilab: A Mathematical Tool	2 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	04 Marks-CA 16 Marks-EoSE
Semester	**Code of the Course**	**Title of the Course/Paper**	**NHEQF Level**	**Credits**
III	UG0105-MAT-63P- 213	Introduction to Scilab: A Mathematical Tool	6	2

Level of Course	Type of the Course	Credit Distribution			Course Delivery Method
		Theory	Practical	Total	
Introductory	UG	0	2	2	Practical, Sixty Hours of Practical

List of Programme Codes in which Offered as Minor Discipline	
Prerequisites	Mathematics course of XII std. of Central Board of Secondary Education or equivalent.
Objectives of the Course:	The objective of the course is to equip students with skills to create, analyze, and understand graphs. To teach the use of computational and programming functions with Scilab. To understand and apply methods for solving linear equations and other mathematical problems.

Sita Meena
04/10
4/10/2024
साक्षी गुप्ता
4/10

Detailed Syllabus

[UG0105-MAT-63P-213] - [Introduction to Scilab: A Mathematical Tool]

Group-A

1. Plotting the graphs of the following functions ax, $\sqrt{(ax+b)}$, $|ax+b|$, $c \pm |ax+b|$, $x^{\pm n}$, e^{ax+b}, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $|\sin(ax+b)|$, $|\cos(ax+b)|$. explaining the effects of change in the real constant a, b and c on graphs. Plotting graphs of hyperbolic functions and inverse trigonometric functions, plotting and analyzing the graphs of polynomials and their derivatives.
2. Complex numbers: Operations like addition, subtraction, multiplication, division, Modulus and inbuilt functions conj, imag, imult, isreal, real.

(20 Hours)

Group-B

1. Matrix operations: addition, multiplication, inverse, transpose, determinant, rank and inbuilt functions eye, ones, zeros. Solving the system of linear equations by using Matrix Division (\ Operator), using 'linsolve' function, using 'inv' function, using 'mldivide' function.
2. Finding Roots of equations by using 'fsolve' function, using 'roots' function, using 'mnewton' function.

(20 Hours)

Group-C

1. Solving linear programming problems by using inbuilt functions of Scilab.
2. Solving Ordinary Differential Equations (ODEs) by using the 'ode' function.

(20 Hours)

Suggested Books and References –

1. Sandeep Nagar, Introduction to Scilab: For Engineers and Scientists, APress; 1st ed. Edition.
2. Claude Gomez, Engineering and Scientific Computing with Scilab, Birkhauser Boston Inc; 1999th edition.
3. Tejas Sheth, Scilab: A Practical Introduction to Programming and Problem Solving, Createspace Independent Pub.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Understand graphical and numerical techniques and their execution on Scilab.
2. Students should gain practical expertise in solving problems involving graphs, matrices, and equations.
3. Students should be prepared to utilise various mathematical techniques to solve different mathematical problems.

Geeta Meena 04/10 4/10/2024

साक्षी गुप्ता 4/10

Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-64T-214] - [Real Analysis-II & Numerical Analysis]
IV-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0105-MAT-64T-214 Real Analysis-II & Numerical Analysis	1 Hrs-CA 3 Hrs-EoSE	20 Marks-CA 80 Marks-EoSE	08 Marks-CA 32 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
IV	UG0105-MAT-64T-214	Real Analysis-II & Numerical Analysis			6	4
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
Introductory	UG	4	0	4	Lecture, Sixty Lectures	
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		UG0105-MAT-63T-211 Real Analysis-I & Differential Equations-I				
Objectives of the Course:		The primary objective of this course is to enable students to understand fundamental concepts of differentiable functions, apply Darboux's, Rolle's theorems, Riemann integration, mean value theorems, and to learn numerical techniques viz interpolation, Numerical integration, roots of equation, solution of initial value problem.				

साक्षी गुप्ता

4/10/2024

Detailed Syllabus

[UG0105-MAT-64T-214] - [Real Analysis-II & Numerical Analysis]

Unit - I

Properties of derivable functions, Darboux's and Rolle's theorem. Notion of limit, continuity and differentiability for functions of two variables. Directional derivative, total derivative, expression of total derivative in terms of partial derivatives.

(15 Lectures)

Unit - II

Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorems of integral calculus, Fundamental theorem of integral calculus. Functions of bounded variations.

(15 Lectures)

Unit -III

Differences. Relation between differences and derivatives. Differences of a polynomial. Newton's formula for forward and backward interpolation. Divided differences. Newton's divided difference, Lagrange's interpolation formula. Numerical Differentiation. Derivatives from interpolation formulae.

(15 Lectures)

Unit-IV

Numerical integration, Derivations of general quadrature formulas, Trapezoidal rule. Simpson's one-third, Simpson's three-eighth and Gauss's quadrature formulae. Numerical solution of Algebraic and Transcendental equations: Bisection method, Secant method, Regula-Falsi method, Iteration method, Newton- Raphson Method. Numerical solutions of ordinary differential equations of first order with initial condition using Euler and modified Euler's method.

(15 Lectures)

Suggested Books and References –

1. Royden H, Fitzpatrick PM. Real analysis. China Machine Press; 2010.
2. Rudin W. Principles of mathematical analysis. New York: McGraw-hill; 1964.
3. Bartle RG, Sherbert DR. Introduction to real analysis. New York: Wiley; 2000.
4. Mapa SK. Introduction to Real Analysis. Sarat Book Distributors; 2014.
5. Malik SC, Arora S. Mathematical analysis. New Age International; 1992.
6. Burden RL, Faires JD. Numerical analysis, brooks;1997.
7. Iyengar SR, Jain RK. Numerical Methods. New Age International; 2009.
8. Sastry SS. Introductory methods of numerical analysis. PHI Learning Pvt. Ltd.; 2012.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials:**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Analyse multivariable functions using differentiability and partial derivatives.
2. Solve problems using Riemann integrability and integral calculus theorems.
3. Use interpolation formulas for data approximation and numerical differentiation.
4. Apply numerical methods to solve equations and differential equations.

साक्षी गुप्ता

Gita Meena

04/10

4/10/2024

Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-64T-215] - [Advanced Analysis]
IV-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0105-MAT-64T-215 Advanced Analysis	1 Hrs-CA 3 Hrs-EoSE	30 Marks-CA 120 Marks-EoSE	12 Marks-CA 48 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
IV	UG0105-MAT-64T-215	Advanced Analysis			6	6
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
Introductory	UG	6	0	6	Lecture, Ninety lectures	
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		UG0105-MAT-63T-211 Real Analysis-I & Differential Equations-I				
Objectives of the Course:		This course aims to equip students with advanced mathematical tools and analytical skills necessary for tackling real-world problems in mathematics, physics, engineering, and related fields.				

Sita Meena
04/10
साक्षी गुप्ता
4/10/2024

Detailed Syllabus

[UG0105-MAT-64T-215] - [Advanced Analysis]

Unit - I

Calculus of Variations- Variation and its properties. Euler's equation. Functionals. Functionals dependent on Higher order derivatives and functions of several independent variables. Variational problems in parametric form. The moving boundary value problem for a function of the form $\int_{xi}^{x_2}(x,y,z)dx$. Euler's finite difference method. Ritz method for variational problem.

(22 Lectures)

Unit - II

Sequence and series of functions – Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration. **(23 Lectures)**

Unit -III

Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set in metric space.

(22 Lectures)

Unit-IV

Compact metric space. Connected metric space.

(23 Lectures)

Suggested Books and References –

1. Royden H, Fitzpatrick PM. Real analysis. China Machine Press; 2010.
2. Rudin W. Principles of mathematical analysis. New York: McGraw-hill; 1964.
3. Bartle RG, Sherbert DR. Introduction to real analysis. New York: Wiley; 2000.
4. Mapa SK. Introduction to Real Analysis. Sarat Book Distributors; 2014.
5. Malik SC, Arora S. Mathematical analysis. New Age International; 1992.
6. Kumaresan S. Topology of metric spaces. Alpha Science Int'l Ltd.; 2005.
7. Gupta AS. Calculus of variations with applications. PHI Learning Pvt. Ltd.; 1996.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials:**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Solve variational problems using Euler's equation and numerical methods.
2. Ensure series of functions converge uniformly using appropriate convergence tests.
3. Analyze metric space properties including open sets and limit points.
4. Apply compactness and connectedness concepts in metric spaces to practical scenarios.

सीता मीना 04/10

4/10/2024

Syllabus
[UG0105-Three/Four Year Bachelor of Science (Mathematics)] - [UG0105-MAT-64P-216] - [Introduction to C Programming: As Mathematical Tool]
IV-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Practical	UG0105-MAT-64P-216 Introduction to C Programming: As Mathematical Tool	2 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	04 Marks-CA 16 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
IV	UG0105-MAT-64P-216	Introduction to C Programming: As Mathematical Tool			6	2
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
Introductory	UG	0	2	2	Practical, Sixty Hours of Practical	
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		Mathematics course of XII std. of Central Board of Secondary Education or equivalent.				
Objectives of the Course:		The objective of the course is to enable students learn the basic knowledge of developing algorithms for various Mathematical problems and preparing codes for these algorithms in C language.				

Sita Meena 04/10

साक्षी गुप्ता

4/10/2024

Detailed Syllabus

[UG0105-MAT-64P-216] - [Introduction to C Programming: As Mathematical Tool]

Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C-Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, Implementing loops in Programs, Defining and manipulating arrays and functions.

Group-A

1. Printing n terms of Fibonacci sequence and finding factorial n, summation n, summation of square of n etc.
2. Defining a function and finding sum of n terms of a series/sequence whose general term is given.
3. Finding gcd and lcm of two numbers by Euclid's algorithm.
4. Checking prime/composite numbers and finding the number of primes less than n, where n is a positive integer.
5. Finding mean, standard deviation and Permutation, Combination.

(20 Hours)

Group-B

6. Numerical integration using Trapezoidal rule.
7. Numerical integration using Simpson's ⅓ rule.
8. Numerical integration using Simpson's 3/8 rule.
9. Numerical integration using Waddle rules.
10. Preparing forward and backward difference tables.

(20 Hours)

Group-C

11. Solution of algebraic and transcendental equations by Bisection method.
12. Solution of algebraic and transcendental equations by Regula-falsi method.
13. Solution of algebraic and transcendental equations by Newton-Raphson method.
14. Solution of Initial value problems by Euler's method.
15. Solution of Initial value problems by Runga-Kutta fourth order method.

(20 Hours)

Suggested Books and References –

1. B. W. Kernighan and D. M. Ritchi : The C-Programming Language, 2nd Edi.(ANSI Refresher), Prentice Hall, 1977.
2. E. Balagurnsamy : Programming in ANSI C, Tata McGraw Hill, 2004.
3. Y. Kanetkar : Let Us C ; BPB Publication, 1999.
4. C. Xavier : C-Language and Numerical Methods, New Age International, 2007.
5. V. Rajaraman : Computer Oriented Numerical Methods, Prentice Hall of India, 1980.

Suggested E-resources:

1. **Online Lecture Notes and Course Materials:**

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Understand the logic for a given problem.
2. Write the algorithm of a given problem.
3. Draw a flow chart of a given problem.
4. Recognize and understand the syntax and construction of C programming code.

4/10/2024

Syllabus

Semester-III

Optics

Semester	Code of the Course	Title of the Course/Paper	NHEQF Level	Credits
III	UG0102, PHY-63T-201	Optics	6	4
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	Major/Minor	Lecture, Sixty Lectures (4 hours in week) including diagnostic and formative assessments during lecture Hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or Equivalent.			
Objectives of the Course:	The student will get an introduction to the discipline of optics and its role in daily life. They will learn basic knowledge of interference, diffraction, polarization, LASER, HOLOGRAPHY and FIBRE OPTICS for future research purposes.			

Unit I

Interference: Concept of Spatial and temporal coherence, coherence length, coherence time, Definition and propagation of wave front, Huygens principle of secondary wavelets, Young's Double Slit Experiment, Types of fringes, Interference by division of wave front: Fresnel's Bi-Prism, Measurement of wavelength and thickness of a thin transparent sheet. Interference by division of amplitude– Thin films (parallel and wedge-shaped films), Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer, the shape of fringes, the Measurement of wavelength, the difference between two spectral lines, and the thickness of a thin transparent sheet. **(15 Lectures)**

04/10/24

4-10-24

Unit II

Diffraction: Fraunhofer diffraction: Single slit; double slit. Multiple slits, missing order, Diffraction grating, Resolving power of grating, Rayleigh's criterion of resolution.

Fresnel Diffraction: Half-period zones. Zone plate. Multiple Foci of zone plate, comparison between zone plate and convex lens, Fresnel Diffraction pattern at a circular aperture, straight edge, and a rectangular slit using half-period zone analysis. **(15 Lectures)**

Unit III

Polarization: Polarization (i) Plane polarized light (ii) Circularly polarized light (iii) Elliptically polarized light, Production of plane-polarized light (i) by reflection (ii) by refraction (iii) by double refraction, and (iv) by dichroism (Polaroid), Brewster's law, Law of Malus, Huygens' wave theory of double refraction, Analysis of Polarized light: Nicol prism, Quarter wave plate, and half-wave plate, Optical activity, Laws of optical activity, and Fresnel's explanation of optical activity; Specific rotation, Polarimeters: Laurent's half shade Polarimeter and Biquartz Polarimeter. **(15 Lectures)**

Unit IV

Quantum Optics and photonics

(i) **Laser:** Spontaneous and stimulated emission, Einstein's A & B coefficients, population inversion, methods of optical pumping. Ruby, He-Ne, and Semiconductor laser (Principle and working).

(ii) **Holography:** Principle of holography, Theory of construction and reconstruction of image, applications of holography.

(iii) **Fiber Optics:** Introduction to optical fiber, types of optical fiber, Total internal reflection, Explanation of propagation of light through an optical fiber

(15 Lectures)

REFERENCES:

1. F.A. Jenkins and H.E. White, Fundamentals of Optics, Tata McGraw Hill.
2. Brij Lal and N. Subrahmaniyam, Optics, S. Chand.
3. E.Hecht, Optics, Pearson.
4. A.K.Ghatak, Optics, Tata Mc Graw Hill.

Course outcomes:

1. The student will get an introduction to the discipline of optics and its role in daily life.
2. The optics course will give the student a basic knowledge of interference, diffraction, and polarization.
3. The student will be able to analyze and calculate interference between light waves and application of the theory to various interferometers along with their practical applications.
4. The student would know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions.
5. The student would understand how the polarization of light changes at reflection and transmission at interfaces.
6. The students are able to understand theory of LASER, HOLOGRAPHY and FIBRE OPTICS for future research purpose.

Syllabus

Physics Lab-III

Semester	Code of the Course	Title of the Course/Paper	NHEQF Level	Credits
III	UG0102,PHY-63P-202	Physics Lab-III	6	2
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	Major/Minor	Practical, Sixty hours of practical including diagnostic and formative assessment during practical hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or Equivalent.			
Objectives of the Course:	1. Ability to find the formation of Newton ring and calculate the wavelength of monochromatic source. 2. Develop an understanding of light dispersion through prisms 3. Proficiency in analyzing and calculating the wavelength of light by grating. 4. Learn to determine the thermal conductivity of band teeth. 5. Develop skills in designing and analyzing the value of inductance by Anderson Bridge. 6. Understand the principle of wavefront division and also learn how to determine the wavelength of sodium light by biprism. 7. Students learn about the sensitivity ballistic galvanometer and determine the value of ballistic constant			

Exam Scheme-

Students will have to perform one practical in the exam. The duration of practical exam will be 4 hours.

Marks distribution

Student category	Experiments	Viva-voice	Record	Maximum marks

Regular Student	20	10	10	40

Marking distribution in practical

Student category	Theory/formula	Figure/circuit	Observation	Calculation	Results/Error	Precautions
Regular	3	2	6	5	3	1

Practical lists-

1. Find the wavelength of the monochromatic source using the Newton ring method and find the refractive index of the liquid.
2. Determine the dispersive power of prism.
3. Determine the wavelength of sodium light using grating.
4. Study the light properties using a fiber optics trainer kit.
5. Measure the induction by the Anderson bridge coil.
6. Determine the wavelength of sodium light using bi-prism.
7. Calculate the ballistic constant of the ballistic galvanometer.
8. Find high resistance by the leakage method.
9. Study the coherent source and coherent time using a diode laser.
10. To study the preparation of air film using the air wedge method.
11. To study the resolving power of prism.
12. To study the resolving power of grating.
13. To study the Rydberg constant by using grating.

Suggested Books and References –

1. Practical Optics, by S. Naftali Men. First Edition (ISBN 13:978-0124909519)

Suggested e-Resources:

http://msbahae.um.edu, University of New Mexico.

Course Learning Outcomes

1. Ability to find the formation of Newton ring and calculate the wavelength of monochromatic source.
2. Develop an understanding of light dispersion through prisms.
3. Proficiency in analyzing and calculating the wavelength of light by grating.
4. Develop skills in designing and analyzing the value of inductance by Anderson Bridge.
5. Understand the principle of wave front division and also learn how to determine the wavelength of sodium light by biprism.
6. Students learn about the sensitivity ballistic galvanometer and determine the value of a ballistic constant.

04/10/24

Syllabus

Semester-IV

Thermodynamics & Statistical Physics

Semester	Code of the Course	Title of the Course/Paper	NHEQF Level	Credits
IV	UG0102,PHY-64T-203	Thermodynamics & Statistical Physics	6	4
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	Major/Minor	Lecture, Sixty Lectures including diagnostic and Formative assessments during lecture hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or Equivalent.			
Objectives of the Course:	By this course, students will have developed a strong understanding of thermal and statistical physics. They will be able to apply the principles and concepts learned to analyze and solve problems related to thermodynamic systems, phase transitions, transport phenomena, low-temperature production, and quantum statistics. Additionally, they will be able to interpret and explain various phenomena and behaviors of macroscopic and microscopic systems using the principles of thermodynamics and statistical mechanics.			

Unit I

Thermal and adiabatic interactions: Thermal interaction, Zeroth law of thermodynamics, systems in thermal contact with a heat reservoir (canonical distribution), Energy Fluctuations, Entropy of a system, Helmholtz free energy, Adiabatic interaction and enthalpy, General interaction and first of thermodynamics, Infinitesimal general interaction, Gibb's free energy, Phase transitions, Triple point, First and second-order phase transition, Clausius-Clapeyron equation, Vapour-pressure curve, transformation of disorder into order, Heat engine and efficiency of engine, Carnot's Cycle; Thermodynamic scale as an absolute scale, Maxwell relations and their applications. **(15 Lectures)**

4/10/24

04/10/24

Unit II

Kinetic Theory: Derivation of Maxwell's law of distribution of velocities and its experimental verification, most probable, average and RMS velocities, Diffusion, Equipartition Theorem, Classical theory of Specific heat capacity, the specific heat of solid (Explanation on the basis of Einstein and Debye Theory.

Transport Phenomenon: Mean free path, Distribution of free path, Coefficients of viscosity, thermal conductivity and diffusion, Brownian motion, Langevin's and Einstein's theories, Experimental determination of Avogadro number. **(15 Lectures)**

Unit III

Production of low temperatures: Cooling by Adiabatic expansion, Coefficient of performance, Joule Thomson effect, J-T coefficient for ideal as well as-Vander Waal's gases, porous plug experiment, Temperature of inversion, Regenerative cooling, Air Liquefiers. Adiabatic demagnetization of paramagnetic substances: Nuclear Para-magnetism, Liquid He I and He II, Superfluidity, Quest for absolute zero, Third law of thermodynamics and Nernst Heat Theorem. **(15 Lectures)**

Unit IV

Quantum Statistics: Introduction to Phase space, Micro and Macro states, Thermodynamic probability, Entropy and probability, Bose-Einstein and Fermi-Dirac distribution laws, Calculation of the thermodynamic functions of weak degenerate gas, Strong degeneration, Calculation of the thermodynamic functions of an ideal Bose gas, Derivation of Plank law, Flux of radiation energy, radiation pressure, thermodynamic functions of an ideal Fermi electron gas, Free electron model for metals, Spectra of metals, Richardson's equation of thermionic emission, Relativistic fermi gas, White dwarf stars, Chandrasekhar mass limit.

(15 Lectures)

Suggested Books and References -

1. Kittle-Thermal Physics.
2. Berkeley Series, Vol. V, Statistical Physics
3. Reif-Thermodynamics and Statistical Physics.
4. Lokanathan and Khandelwal Thermodynamics and Statistical Physics.
5. Sears Thermodynamics, Kinetic Theory of Gases and Statistical Physics.

04/10/24

4-10-24

Suggested E-sources:

1. MIT Open Course Ware: Statistical Mechanics 1: Statistical Mechanics of Particles- This resource offers lecture notes, assignments, and exams for a complete course on Statistical Mechanics-I,https://ocw.mit.edu/courses/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/pages/syllabus/

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Understand the concepts of thermal interactions and the law of thermodynamics.
2. Calculation of the entropy of a system and analyze the Helmholtz free energy.
3. Study infinitesimal general interactions and Gibb's free energy.
4. Explore phase transitions, including first and second-order phase transitions. Understand the Clausius-Clapeyron equation and the vapour pressure curve.
5. Learn about the thermodynamic scale as an absolute scale and apply Maxwell relations.
6. Explore the classical theory of specific heat capacity and analyze the specific heat of solids.
7. Study the production of low temperatures and cooling by adiabatic expansion.
8. Explore regenerative cooling and air liquefiers.
9. Understand adiabatic demagnetization of paramagnetic substances and the properties of liquid He 1 and He II, including super-fluidity.
10. Study phase space, microstates, macrostates, thermodynamic probability, and entropy. Learn about quantum statistics, including Bose-Einstein and Fermi-Dirac distribution laws.
11. Analyze the behavior of an ideal Bose gas.
12. Understand the free electron model for metals, the spectrum of metals, relativistic Fermi gas, and the Chandrasekhar mass limit for white dwarf stars.

    By the end of this course, students will have developed a strong understanding of thermal and statistical physics. They will be able to apply the principles and concepts learned to analyze and solve problems related to thermodynamic systems, phase transitions, transport phenomena, low- temperature production, and quantum statistics. Additionally, they will be able to interpret and explain various phenomena and behaviors of macroscopic and microscopic systems using the principles of thermodynamics and statistical mechanics.

04/10/24

Syllabus

Physics Lab-IV

Semester	Code of the Course	Title of the Course / Paper	NHEQF Level	Credits
IV	**UG0102,PHY-64P-204**	**Physics Lab –IV**	**6**	**2**
Level of Course	Type of Course	Delivery of the Course		
Introductory	Major	Lecture, Sixty Lectures(4 hour in a week) including diagnostic and formative assessment during lecture hours.		
Prerequisites	Practical, sixty hours (4 hours in a week) of practical including diagnostic and formative assessment during practical hours			
Objectives of the Course	To provide hands-on experience in conducting experiments related to Thermal and statistical Physics. To develop practical skills in using various experimental components and instruments. To reinforce theoretical concepts learned in the corresponding lecture course through practical applications. To enhance problem-solving and analytical skills by analyzing experimental data and interpreting results. To promote scientific inquiry, critical thinking, and the ability to design and execute experiments. To foster teamwork and collaboration in conducting experiments and analyzing results. To develop skills in accurately measuring and recording Experimental data.			

The colleges are free to set new experiments of equivalent standards. This should be intimated and approved by the Convener, Board of Studies before the start of the academic session. It is

binding on the college to have an experimental set-up of at least ten experiments listed below. In case the number of experiments performed by the student is less than eight, his marks shall be scaled down in the final examination on a pro-rata basis. Laboratory examination paper will be set by the external examiner out of eight or more experiments available at the centre

Exam Scheme-

Students will have to perform one practical in the exam. The duration of practical exam will be 4 hours.

Marks distribution

Student category	Experiments	Viva-voice	Record	Maximum marks
Regular Student	20	10	10	40

Marking distribution in practical

Student category	Theory/formula	Figure/circuit	Observation	Calculation	Results/Error	Precautions
Regular	3	2	6	5	3	1

List of Experiments -

1. To find out the melting-point of a given substance using platinum resistance thermometer.
2. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer
3. To determine the Specific Heat of a Liquid using a Calorimeter.
4. Determination of Specific Heat Capacity of a Liquid using the Method of Cooling.
5. To Study the Variation of Thermo-emf with Temperature.
6. Determination of the Coefficient of Thermal Conductivity of a Bad Conductor by Lee and Charlton's Disc Method.
7. Determination of the Coefficient of Thermal Conductivity of Copper by Searle's Apparatus.

04/10/24

8. Determination of Stefan's Constant using Black Body Radiation.
9. Determination of Planck's constant.
10. To Study the Linear expansion of different solid samples.
11. Determination of Thermal conductivity by Armstrong method.
12. Study of Phase Transitions and Interpretation of Cooling Curves.
13. To study the blackbody spectrum of light intensity for a light bulb.
14. Experimental Determination of γ using Clement and Desormes Method
15. Study of variation of total thermal radiation with temperature.
16. To investigate the rate of thermal conduction through some common materials.
17. Determine the specific heat capacity of the given solid by Ice Calorimetry
18. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath).

Suggested Books and Reference-

Suggested E-resources:

http://egyankosh.ac.in//handle/123456789/67451

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Demonstrate proficiency in using various thermodynamically components and instruments required for conducting experiments.
2. Apply theoretical concepts of thermodynamics and statistical dynamics to design and execute experiments.
3. Analyze experimental data using appropriate mathematical and statistical techniques.
4. Interpret experimental results and draw conclusions based on data analysis.
5. Develop skills in accurately measuring physical quantities and recording experimental observations.
6. Communicate experimental procedures, results, and conclusions effectively in written reports.

04/10/24

राजर्षि महाविद्यालय, अलवर

B.Sc. (Bio & Math Group, chemistry & Mathematics) Semester I & III

Hindi - I

पूर्णांक - 40

समय - 1.30

नोटः– इस प्रश्नपत्र में प्राप्त अंको को श्रेणी निर्धारण हेतु नहीं जोडा जायेगा।

प्रश्नपत्र में दो भाग होंगे–1. साहित्य खण्ड 2. व्याकरण खण्ड

साहित्य खण्ड में दो भाग होंगे– गद्य भाग एवं पद्य भाग

साहित्य खण्ड (गद्य भाग)

गद्य भाग = 16 अंक

1. प्रेमचन्द – नमक का दारोगा (कहानी) व्याख्या 8 अंक
2. महादेवी – प्रणाम (संस्मरण)
3. बनारसी दास चतुर्वेदी – बाईस वर्ष बाद (रेखाचित्र) प्रश्न 8 अंक
4. गुणाकर मुले – शनि सबसे सुन्दर ग्रह (विज्ञान)
5. पद्य भाग

पद्य भाग – 16 अंक

1. कबीर – 20 साखिया, कबीर ग्रथावली – सं. डॉ श्यामसुन्दरदास

(i) गुरुदेव कौ अंग –3,11,12,22,–(साखी नं.)

(ii) बिरह कौ अंग –5,11,31,32,–(साखी नं.)

(iii) करणी बिन कथनी –5 ,–(साखी नं.)

(iv) भ्रम बिधौसण कौ अंग –10 ,–(साखी नं.) 8 अंक

(v) भेष कौ अंग –5,12 ,–(साखी नं.)

(vi) कुसंगति कौ अंग – 1,7 ,–(साखी नं.)

(vii) कसतूरिया मृग कौ अंग –1 ,–(साखी नं.)

(viii) चितावनी कौ अंग –1 ,–(साखी नं.)

(ix) साध कौ अंग –1 ,–(साखी नं.)

(x) उपदेश कौ अंग –9, –(साखी नं.)

27-9-23 Dr. Richa Meena

C.B. Meena 27-9-23

(Bhagirath Prasad Meena) 27/09/23

(प्रो० उमेश कुमार राय)

(xi) काल कौ अंग —1, 4 —(साखी नं.)

2. सूरदास—वात्सलय वर्णन, सूरसागर—दशम स्कन्ध पद संख्या—43,75,99,108,249,344

3. तुलसीदास —कवितावली सं. रामचन्द्र शुल्क—नागरी प्रचारिणी सभा

(1) पुरतें निकसी रघुबीर बधू (2) जल को गए लक्खन

(3) बनिता बनी स्यामल गौर (4) रानी मैं जानी अजानी

(5) सीस जटा उर बाहुविसाल (6) सुनि सुंदर बैन सुधारस साने

4. रहीम— 10 दोहे रहीम ग्रंथावली—पं. विद्यानिवास मिश्र 8 अंक

(1) प्रीतम छवि नैनन बसी (2) बसि कुसंग चाहत कुसल 1 व्याख्या

(3) रहिमन आंसुना नयन ढरि (4) रहिमन ओछे नरन सो 1 प्रश्न

(5) रहिमन निजमन की व्यथा (6) काज परै कछु और हैं

(7) रहिमन धागा प्रेम का (8) पावस देखि रहीम मन

(9) रूठे सुजन मनाइये, जो रूठे सौ बार (10) रहिमन पानी राखिए, बिन पानी सबसून

(ब) व्याकरण खण्ड = 8 अंक

1. निबंध लेखन (विकल्प देय एवं शब्द सीमा 300 शब्द)
2. कार्यालयी पत्र / अर्द्धशासकीय पत्र / परिपत्र / ज्ञापन / विज्ञप्ति / निविदा
3. संक्षेपण 8 अंक
4. पल्लवन
5. उपसर्ग, संधि, प्रत्यय, समास
6. वाक्य शुद्धि / शब्द शुद्धि
7. मुहावेर / लोकोक्तियाँ

27-9-23
Dr. Richa Meena

C.B. Meena
27/9/23

Bhagirath Bairwa (Meena)
27/09/23

NEW SYLLABUS

राजर्षि महाविद्यालय, अलवर

B.Sc. (Bio & Math Group, chemistry & Mathematics) Semester II & IV

Hindi - II

समय – 1.30 पूर्णांक 40 अंक

नोट:– इस प्रश्नपत्र में प्राप्त अंको को श्रेणी निर्धारण हेतु नहीं जोडा जायेगा।

प्रश्नपत्र में दो भाग होंगे–1. साहित्य खण्ड 2. व्याकरण खण्ड

साहित्य खण्ड में दो भाग होंगे– गद्य भाग एवं पद्य भाग

(अ) साहित्य खण्ड (गद्य भाग) = 16 अंक

1. हरिशंकर परसाई– भोलाराम का जीव (व्यंग्य) 8 अंक व्याख्या
2. भारत भूषण अग्रवाल– महाभारत की एक सांझ (एकांकी) 8 अंक प्रश्न
3. रामचन्द्र शुक्ल– उत्साह (ललित निबंध)

पद्य भाग = 16 अंक

1. मैथिली शरण गुप्त– मातृभूमिए वही मनुष्य है कि जो मनुष्य के लिए मरे
2. सुमित्रानंदन पंत– भारतमाता, पावस ऋतु में पर्वत प्रदेश 8 अंक व्याख्या
3. दिनकर –रश्मिरथी (तृतीय सर्ग से)
   (सच है, विपत्ति जब आजी है .....क्या कर सकती है चिनगारी) 8 अंक प्रश्न
4. नागार्जुन–अकाल और उसके बाद, बादल को घिरते देखा है।

गद्य व पद्य दोनों को एक ही पाठ्य पुस्तक में संकलित किया जाएगा।

(ब) व्याकरण खण्ड = 8 अंक

1. पारिभाषिक, शब्दावली
2. संज्ञा, सर्वनाम, विशेषण, क्रिया, क्रिया विशेषण (व्यावाहारिक पक्ष)
3. शब्द युग्मों का अर्थ भेद — 8 अंक
4. वाक्यांश के लिए एक शब्द
5. पर्यायवाची / विलोम शब्द

Dr. Richa Meena 27-9-23

C.B. Meena 27/9/23

Bhagwati Prasad Meena 27/09/23

अंक विभाजन:--

कुल चार संख्या — 2 गद्य भाग से

2 पद्य भाग से

कुल चार आलोचनात्मक प्रश्न

2 गद्य भाग से

2 पद्य भाग से

प्रथम सेमेस्टर – I	सेमेस्टर – II
1 गद्य भाग - 1 व्याख्या - 8 अंक; 1 प्रश्न - 8 अंक	1 गद्य भाग - एक व्याख्या - 8 अंक; प्रश्न - 8 अंक
2 पद्य भाग - 1 व्याख्या - 8 अंक; 1 प्रश्न - 8 अंक	2 पद्य भाग - एक व्याख्या - 8 अंक; प्रश्न - 8 अंक
3 - भाग व्याकरण - 8 अंक	3 व्याकरण - 8 अंक

C.D. Meena
27/9/23

Bhagirath
(Bhagirath Prasad Meena)
27/09/23

(प्रो० आशा कुमारी)

Dr. Richa Meena
27-9-23

SEC- Logical and Critical Thinking

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
III & IV	SEC-	Logical and Critical Thinking			5	2
Level of Course	Type of the Course	Credit Distribution		Offered to NC Student	Delivery Type of the Course	
		Theory	Practical			
Introductory	Skill Enhancement	2	-	Yes	30 Hours Lecture	
Prerequisites	XII Pass					
Objectives of the Course:	Objectives of the Course - This course aims to equip students with a comprehensive understanding of various logical reasoning concepts and critical thinking techniques. Through a diverse range of topics and exercises, the course seeks to enhance students' ability to analyze information, evaluate arguments. solve complex problems, and make informed decisions. By the end of the course, students should have a solid foundation in logical reasoning and critical thinking. empowering them to excel in various academic, professional. and everyday scenarios.					

Examination Scheme

Type	Paper code and Nomenclature	Duration of Examination	M:,:1.imum Marks (Midterm + EoSE)	Minimum Marks (Midterm + EoSE)
Theory	SEC-004- Logical and Critical **Thinking**	I Hrs.-MT I **Hrs.-EoSE**	**10 Marks-MT** 40 **Marks-EoSE**	4 Marks-MT I6 **Marks-EoSE**

Syllabus

SEC-

Logical and Critical Thinking

Unit - I

Alphabet test, Alphanumeric series, Analogy, Analytical and Decision Making, Arithmetic Reasoning, Artificial Language,

(7 Lectures)

Unit - II

Blood Relations, Calendars, Cause and Effect, Classification, Clocks, Code lnequalities, Coded equations, Coding and Decoding, Course of Action, Critical path, Critical Reasoning, Cubes and cuboids,

(8 Lectures)

Unit - III

Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices. Direction questions, Embedded images, Figure Matrix, Input-Output, Mirror and Water Images, Odd One Out, Ordering and Ranking, Paper folding; unfolding questions **(8 Lectures)**

Unit- IV

Picture Series and Sequences, Puzzles, Reasoning Analogies, Seating Arrangements. Shape Construction, Statement and Assumptions, Statement and Conclusions, Syllogism, Venn Diagram. Verbal Reasoning, Visual Reasoning **(7 Lectures)**

Suggested Books and References-

1. A Modern Approach to Logical Reasoning by R.S. Aggarwal
2. Logical and Analytical Reasoning by A.K. Gupta
3. How to Prepare for Logical Reasoning for CAT by Arun Sharma
4. Verbal and Non-Verbal Reasoning by R.S. Aggarwal
5. Analytical Reasoning by M.K. Pandey
6. Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
7. The Power Score LSAT Logical Reasoning Bible by David M. Killoran
8. Critical Thinking: A Student's Introduction by Gregory Bassham, William lrwin, and Henry Nardone
9. Thinking, Fast and Slow by Daniel Kahneman
10. I 0. The Art of Thinking Clearly by Rolf Dobell

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Demonstrate Proficiency in Various Logical Reasoning Techniques: Students ill grasp the fundamental principles of logical reasoning and apply techniques such as analogy, class1ficatwn, coding-decoding, statement analysis, syllogism and more.
2. Enhance critical thinking skills, student will develop the ability to critically evaluate the information. Identifying assumptions and analyses arguments to make well reason decisions.
3. Solve Complex Problems: Student, will be adept at solving intricate problems involving arithmetic reasoning, puzzles, sequencing, and other logical challenges.
4. Interpret Visual and Verbal Data: Students will effectively interpret visual information, such **as figure matrices and comprehend verbal reasoning exercises to arrive at accurate conclusions,**
5. Navigate Various Question Types: Students will become proficient in handling a wide range of logical reasoning question formats, including seating arrangements, blood relations, **calendars, and more.**
6. Strengthen Decision-Making Abilities: Students will sharpen their decision-making skills by considering cause and effect relationships, identifying critical paths, and applying course of action principles.
7. Enhance Test-Taking Abilities: Students will be well-prepared for competitive exams and assessments that include logical reasoning sections, as they will have practiced a diverse set of reasoning challenges.
8. Apply Logical Thinking in Real-Life Contexts: Students will be able to apply logical and critical thinking techniques to real-life situations, improving their problem-solving abilities **in various domains.**

Syllabus

SEC- Quantitative Aptitude and Data Interpretation

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
III & IV	SEC	Quantitative Aptitude and Data Interpretation			5	2
Level of Course	Type of the Course	Credit Distribution		Offered to NC Student	Delivery Type of the Course	
		Theory	Practical			
Introductory	Skill Enhancement	2	-	Yes	30 Hours Lecture	
Prerequisites	XII Pass					
Objectives of the Course:	Objectives of the Course - • To provide a strong foundation in the number system and basic arithmetic concepts. • To understand divisibility rules, decimal fractions, greatest common divisor (GCD), least common multiple (LCM), surds, indices, and simplifying square and cube roots. • To solve problems related to averages, ages, allegations, and percentages.					

Examination Scheme

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (Midterm + EoSE)	Minimum Marks (Midterm + EoSE)
Theory	SEC- Quantitative Aptitude and Data Interpretation	1 Hrs.-MT 1 Hrs.-EoSE	10 Marks-MT 40 Marks-EoSE	4 Marks-MT 16 Marks-EoSE

Detailed Syllabus

SEC- Quantitative Aptitude and Data Interpretation

Unit-I

Number system. divisibility, decimal fractions. GCD & LCM. surds and indices. Squares and Cubes, square roots and cube roots, problerns on averages and ages, allegations, percentage.

(08 Lectures)

Unit-II

Profit & loss, partnership, discount, simple & compound interest, ratio & proportion and variation.

(06 Lectures)

Unit -III

Time and work, time, speed and distance. geometry and mensuration, coordinate geometry, functions, inequalities, quadratic and other equat10ns, logarithms. Permutations and combinations, probability, set theory.

(08 Lectures)

Unit-IV

Basic modes of data Interpretation. Data. Nature of Data, Data represents variable. types of variable need for capturing data. Data interpretation -definition, organization and presentation. Tabular presentation. Tables, bar Charts- Simple, Stacked, Composite. representation of percentage, show deviation, XY Charts, Pie Charts. Cases. Challenges of data interpretation. Data Sufficiency.

(08 Lectures)

Suggested Books and References -

I. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand, 2018.
1. Arun Sharma, Teach Yourself Quantitative Aptitude. McGraw Hill, 20!9.
2. P.A. Anand. Wiley Quantitative Aptitude For Competitive Exams, Wiley India Pvt.Ltd, 2015,
3. Rajesh Verma, Fast Track Objective Arithmetic. Arihant Publications, 2018.
4. Nishit K. Sinha - The Pearson Guide to Quantitative Aptitude and Data Interpretation fur the CAT-Pearson Education (2012)

Course Learning Outcomes:

By the end of the course students will be proficient in solving a range of mathematical problems. interpreting data. and making informed decisions in various contexts. They will have developed quantitative reasoning skills that can be applied both academically and in practical situations.

NUTRITION FOR HEALTH AND FITNESS

Programme Objective:

The course has been planned to provide the student about basic concept of health, wellness and fitness. The course shall create awareness about the importance of correct dietary and physical activity practices for positive health and wellness. The student shall understand balanced diet and impact of processed foods on health. An understanding of the current health scenario in the country and globally will be imported.

Course content

UNIT-I

Health & Fitness: Concept of positive Health and Wellness as per WHO Guideline, Physical Fitness – definition, Role of Nutrition for Health and Fitness.

UNIT-II

Nutritional Guidelines: Balanced Diets and Food Pyramid. How to plan balanced diets for various age groups. Dietary Goals and Guidelines for Indians (Reference man &woman).

UNIT-III

Processed Foods: Concept of Processed Foods, Impact of Packaged, Ultra-processed and Convenience Foods on Health.

UNIT-IV

Physical Activity & Nutrition: Effects on health of Physical Activity and Dietary Habits, Dual Burden of Malnutrition.

Suggested Books/References/Web-links:

(l) M.Swaminathan (201SJ: Advanced Text Book of Food and Nutrition. Volume J & II. The Bangalore Press, India.

(2) Ravindra Chadhha &Pulkit Mathur (201S) : Nutrition and Life Cycle Approach. The Orient Blackswan; First Ed.

(3) Dietary Guidelines for Indians -A Manual (201 l) ,NIN, Hyderabad

(4) h\tr>s://cdn.who.int/rnedia/docsldefault-source/health-gromotionlfrarnework4wellbeing 1 6dec22.gdf?sfvrsn=32a0e228 4&download=true.

(5) hws://www.researchgate.net/12ublication/S1711287 Consensus Physical Activity.

Programme Outcome

1. Enhancing the basic under standing of nutrition and physical fitness
2. Developing a healthy attitude to wards physical well being
3. Inculcating values of conscious and correct eating habits
4. Awareness generation regarding processed foods and their effects on health & wellness
5. Understanding importance of physical activity and its effect on health &wellness.

NATIONAL SERVICE SCHEME

Programme Objective:

Understanding the community in which the volunteers works, relation to their community, identifying the needs and problems of the community and involve them in problem-solving exercises and utilising their knowledge in finding practical solutions to individual and community problems. Mobilising community participation and acquire leadership qualities and democratic attitudes. To practice national integration and social harmony.

Course content

UNIT-I

Introduction to NSS: History, philosophy, aims & objectives of NSS. Emblem, flag, motto, song and badge. Organizational structure, roles and responsibilities of various NSS functionaries.

UNIT-II

NSS Programmes and Activities: Concept of regular activities, One day camps and seven day camp. Basis of adoption of slum/village. Youth development programmes/ schemes of Govt. of India. Collaboration with different agencies.

UNIT-III

Awareness programmes: First aid training, Traffic awareness programme, Self defence.

UNIT-IV

Importance and role of youth leadership in society: Volunteerism and leadership, Gender and society, Fundamental rights, Consumer rights

Suggested Books/References/Web-links:

1. NSS manual
2. https://nss.gov.in
3. yas.nic.in

Programme Outcome

1. Understanding role of volunteership.
2. Activation in the community participation.
3. Promoting leadership skills and social awareness.
4. Youth integration and understanding culture.
5. Better connect with society and building harmony.

(Dr. C. P. Mahendra) Dr. Ram Nath Khanna,