

B.Sc., Mathematics Syllabus
Under Choice Based Credit System

w.e.f (2019-20)



DEPARTMENT OF MATHEMATICS
NIZAM COLLEGE (AUTONOMOUS)
Osmania University, Hyderabad 500 001

DEPARTMENT OF MATHEMATICS
NIZAM COLLEGE (A)

SEMESTER-I

Differential Equations

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit-I

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y)- Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation. **Applications of First Order Differential Equations:** Growth and Decay - Dynamics of Tumour Growth - Radioactivity and Carbon Dating - Compound Interest - Orthogonal Trajectories

Unit-III

Higher order Linear Differential Equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}$, $b \sin ax/b \cos ax, bx^k, V e^{ax}$ Method of undetermined coefficients.

Unit- IV

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations.

Partial Differential Equations: Formation and solution- Equations easily integrable - Linear equations of first order.

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Praveen
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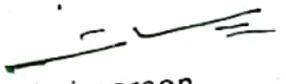
Text:

- Zafar Ahsan, *Differential Equations and Their Applications*

References:

- Frank Ayres Jr, *Theory and Problems of Differential Equations.*
- Ford, L.R; *Differential Equations.*
- Daniel Murray, *Differential Equations.*
- S. Balachandra Rao, *Differential Equations with Applications and Programs.*
- Stuart P Hastings, J Bryce McLead; *Classical Methods in Ordinary Differential Equations.*


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DEPARTMENT OF MATHEMATICS
NIZAM COLLEGE (A)

SEMESTER-II

Differential and Integral Calculus

Objective: The course is aimed at exposing the students to some basic notions in differential calculus.

Outcome: By the time students complete the course they realize wide ranging applications of the subject.

Unit- I

Partial Differentiation: Introduction - Functions of two variables - Neighbourhood of a point (a, b) - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Geometrical representation of a Function of two Variables - Homogeneous Functions.

Unit- II

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Equality of $f_{xy}(a, b)$ and $f_{yz}(a, b)$ - Taylor's theorem for a function of two Variables - Maxima and Minima of functions of two variables - Lagrange's Method of undetermined multipliers.

Unit- III

Curvature and Evolutes: Introduction - Definition of Curvature - Radius of Curvature - Length of Arc as a Function, Derivative of arc - Radius of Curvature - Cartesian Equations - Newtonian Method - Centre of Curvature - Chord of Curvature.

Evolutes: Evolutes and Involutes - Properties of the evolute.

Envelopes: One Parameter Family of Curves - Consider the family of straight lines - Definition - Determination of Envelope.

Unit- IV

Lengths of Plane Curves: Introduction - Expression for the lengths of curves $y = f(x)$ - Expressions for the length of arcs $x = f(y)$; $x = f(t)$, $y = \phi(t)$; $r = f(\theta)$

Volumes and Surfaces of Revolution: Introduction - Expression for the volume obtained by revolving about either axis - Expression for the volume obtained by revolving about any line - Area of the surface of the frustum of a cone - Expression for the surface of revolution - Pappus Theorems - Surface of revolution.

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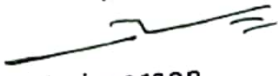

Text:

- Shanti Narayan, P.K. Mittal *Differential Calculus, S.CHAND, NEW DELHI*
- Shanti Narayan *Integral Calculus, S.CHAND, NEW DELHI*

References:

- William Anthony Granville, Percy F Smith and William Raymond Longley; *Elements of the differential and integral calculus*
- Joseph Edwards , *Differential calculus for beginners*
- Smith and Minton, *Calculus*
- Elis Pine, *How to Enjoy Calculus*
- Hari Kishan, *Differential Calculus*


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Nizam College (Autonomous)

Model Question Paper for Internal Examination

Marks: 15

Time: 45 Min

I. Fill in the blanks (10X $\frac{1}{2}$ = 5)

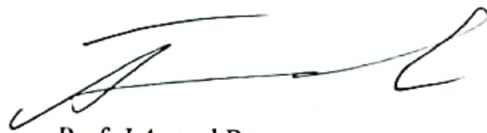
- 1.
- 2.
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- 9.
- 10.

II. Multiple Choice Questions (10X $\frac{1}{2}$ = 5)


- 1.
- 2.
- 3.
- 4.
- 5.
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- 7.
- 8.
- 9.
- 10.


III. Short Answer Questions (5X1=5)

- 1.
- 2.
- 3.
- 4.
- 5.



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NIZAM COLLEGE (AUTONOMOUS):: OSMANIA UNIVERSITY
Model Theory Question Paper (I, II – Sem.)

Subject:

Duration of the Examination: 3 hrs

Paper:

Maximum Marks: 80

Section – A (4 X 6=24 Marks)
(Short Answer question)

1. Unit - I
2. Unit - II
3. Unit - III
4. Unit - IV

Section – B (4 X 14 = 56 Marks)
(Essay Questions)

5. (a) UNIT-I

(b)

(OR)

6. (a) UNIT-II

(b)

(OR)

7. (a) UNIT-III


(b)

(OR)

8. (a) UNIT-IV


(b)

(OR)


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1.4 Algebra

(w.e.f. academic year 2020-21)

DSC-1D

BS:401

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and
Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

Unit- I

Groups: Definition and Examples of Groups- Elementary Properties of Groups-Finite Groups - Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups.

Cyclic Groups: Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups.

Unit- II

Permutation Groups: Definition and Notation -Cyclé Notation-Properties of Permutations -A Check Digit Scheme Based on D_5 . Isomorphisms ; Motivation- Definition and Examples -Cayley' s Theorem Properties of Isomorphisms -Automorphisms-Cosets and Lagrange' s Theorem Properties of Cosets 138 - Lagrange' s Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a Soccer Ball.

Unit- III

Normal Subgroups and Factor Groups: Normal Subgroups-Factor Groups -Applications of Factor Groups -Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem.

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings - Subrings.

Integral Domains: Definition and Examples - Fields - Characteristics of a Ring.

Unit- IV

Ideals and Factor Rings: Ideals -Factor Rings -Prime Ideals and Maximal Ideals.

Ring Homomorphisms: Definition and Examples-Properties of Ring- Homomorphisms.


Text:


- Joseph A Gallian, *Contemporary Abstract algebra (9th edition)*

References:

- Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R,*Basic Abstract Algebra*
- Fraleigh, J.B, *A First Course in Abstract Algebra.*

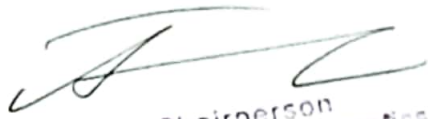
9



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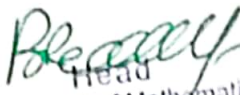

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- Herstein, I.N, *Topics in Algebra*
- Robert B. Ash, *Basic Abstract Algebra*
- I Martin Isaacs, *Finite Group Theory*
- Joseph J Rotman, *Advanced Modern Algebra*



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SEMESTER-III

1.3 Real Analysis

(w.e.f. academic year 2020-21)

DSC-1C

BS:301

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1hours/week

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

Unit- I

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences- Monotone Sequences and Cauchy Sequences -Subsequences-Lim sup' s and Lim inf' s-Series-Alternating Series and Integral Tests .

Unit- II

Continuity: Continuous Functions -Properties of Continuous Functions -Uniform Continuity - Limits of Functions

Unit- III

Differentiation: Basic Properties of the Derivative - The Mean Value Theorem - *L' Hospital Rule - Taylor' s Theorem.

Unit- IV


Integration : The Riemann Integral - Properties of Riemann Integral-Fundamental Theorem of Calculus.


Text:

- Kenneth A Ross,*Elementary Analysis-The Theory of Calculus*

References:

- S.C.Malik and Savita Arora, *Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International (P) Limited, New Delhi, 1994.*
- William F. Trench, *Introduction to Real Analysis*
- Lee Larson , *Introduction to Real Analysis I*
- Shanti Narayan and Mittal, *Mathematical Analysis*
- Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner, *Elementary Real analysis*
- Sudhir R., Ghorpade, Balmohan V., Limaye; *A Course in Calculus and Real Analysis*


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8




1.10 Logic and Sets

(w.e.f. academic year 2020-21)

SEC - II

Theory: 4 credits and Tutorials: 0 credits
Theory: 4 hours /week and
Tutorials: 1 hours/week

Objective: Students learn some concepts in set theory and logic.

Outcome: After the completion of the course students appreciate its importance in the development of computer science.

Unit- I

Basic Connectives and truth tables - Logical equivalence : Laws of Logic - Logical Implication : Rules Inference : The Use of Quantifiers - Quantifiers, Definitions, and proofs of Theorems.

Unit- II

Sets and Subsets - Set Operations and the Laws of Set Theory - Counting and Venn Diagrams - A First Word on Probability - The axioms of Probability - Conditional Probability: Independence - Discrete Random variables .

Text:

- Ralph P Grimaldi, *Discrete and Combinatorial Mathematics* (5e)

References:

- P R Halmos, *Naïve Set Theory*
- E Kamke , *Theory of Sets*



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1.9 Theory of Equations

(w.e.f. academic year 2020-21)

SEC-II

Theory: 2 credits
Theory: 2 hours /week

Objective: Students learn the relation between roots and coefficients of a polynomial equation, Descartes' rule of signs in finding the number of positive and negative roots if any of a polynomial equation besides some other concepts.

Outcome: By using the concepts learnt the students are expected to solve some of the polynomial equations.

Unit- I

Graphic representation of a polynomial-Maxima and minima values of polynomials-Theorems relating to the real roots of equations-Existence of a root in the general equation -Imaginary roots-Theorem determining the number of roots of an equation-Equal roots-Imaginary roots enter equations in pairs-Descartes' rule of signs for positive roots- Descartes' rule of signs for negative roots.

Unit- II


Relations between the roots and coefficients-Theorem-Applications of the theorem-Depression of an equation when a relation exists between two of its roots-The cube roots of unity Symmetric functions of the roots-examples.


Text:

- W.S. Burnside and A.W. Panton, *The Theory of Equations*

References:

- C. C. Mac Duffee, *Theory of Equations*
- Hall and Knight, *Higher Algebra*


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1.11 Number Theory

(w.e.f. academic year 2020-21)

SEC-IV

Theory : 2 credits Theory : 2 hours /week

Objective: Students will be exposed to some of the jewels like Fermat's theorem, Euler's theorem in the number theory.

Outcome: Student uses the knowledge acquired solving some divisor problems.

Unit- I

The Goldbach conjecture - Basic properties of congruences- Binary and Decimal Representation of Integers - Number Theoretic Functions; The Sum and Number of divisors- The Mobius Inversion Formula- The Greatest integer function.

Unit- II


Euler's generalization of Fermat's Theorem: Euler's Phi function- Euler's theorem Some Properties of the Euler's Phi function.


Text:

- David M Burton, *Elementary Number Theory (7e)*

References:

- Thomas Koshy, *Elementary Number Theory and its Applications*
- Kenneth H Rosen, *Elementary Number Theory*


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1.12 Vector Calculus

(w.e.f. academic year 2020-21)

SEC-IV Theory:2credits
Theory:2hours/week

Objective: Concepts like gradient, divergence, curl and their physical relevance will be taught.
Outcome: Students realize the way vector calculus is used to addresses some of the problems of physics.

Unit- I

Line Integrals: Introductory Example - Work done against a Force-Evaluation of Line Integrals
Conservative Vector Fields.

Surface Integrals: Introductory Example : Flow Through a Pipe Evaluation of Surface Integrals.

Unit- II

Volume Integrals: Evaluation of Volume integrals


Gradient, Divergence and Curl: Partial differentiation and Taylor series-Partial differentiation
Taylor series in more than one variable-Gradient of a scalar field-Gradients, conservative fields and
potentials-Physical applications of the gradient.

Text:

- P.C. Matthews, *Vector Calculus*

References:

- G.B. Thomas and R.L. Finney, *Calculus*
- H. Anton, I. Bivens and S. Davis ; *Calculus*
- Smith and Minton, *Calculus*


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Nizam College (Autonomous)

Model Question Paper for Internal Examination

Marks: 15

Time: 45 Min

I. Fill in the blanks (10X $\frac{1}{2}$ = 5)

- 1.
- 2.
- 3.
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- 10.

II. Multiple Choice Questions (10X $\frac{1}{2}$ = 5)

- 1.
- 2.
- 3.
- 4.
- 5.
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- 10.

III. Short Answer Questions (5X1=5)

- 1.
- 2.
- 3.
- 4.
- 5.



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NIZAM COLLEGE (AUTONOMOUS):: OSMANIA UNIVERSITY
Model Theory Question Paper (III, IV– Sem.)

Subject:

Duration of the Examination: 3 hrs

Paper:

Maximum Marks: 80

Section – A (4 X 6=24 Marks)
(Short Answer question)

1. Unit - I
2. Unit - II
3. Unit - III
4. Unit - IV

Section – B (4 X 14 = 56 Marks)
(Essay Questions)

5. (a) UNIT-I

(b)

(OR)

6. (a) UNIT-II

(b)

(OR)

7. (a) UNIT-III

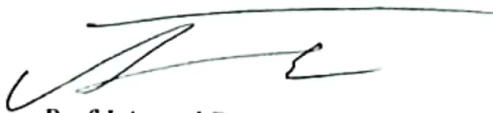
(b)


(OR)


8. (a) UNIT-IV

(b)

(OR)


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1.5 Linear Algebra

(w.e.f. academic year 2021-22)

DSC-E

BS:501

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The students are exposed to various concepts like vector spaces , bases , dimension, Eigen values etc.

Outcome: After completion this course students appreciate its interdisciplinary nature.

Unit- I

Vector Spaces: Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transformations -Linearly Independent Sets; Bases -Coordinate Systems -The Dimension of a Vector Space

Unit- II

Rank-Change of Basis - Eigenvalues and Eigenvectors - The Characteristic Equation

Unit- III

Diagonalization -Eigenvectors and Linear Transformations -Complex Eigenvalues - Applications to Differential Equations.

Unit- IV


Orthogonality and Least Squares : Inner Product, Length, and Orthogonality -Orthogonal Sets -Orthogonal Projections - The Gram-Schmidt Process.

Text:

- David C Lay, *Linear Algebra and its Applications 4e*


References:

- S Lang, *Introduction to Linear Algebra*
- Gilbert Strang , *Linear Algebra and its Applications*
- Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence; *Linear Algebra*
- Kuldeep Singh; *Linear Algebra*
- Sheldon Axler; *Linear Algebra Done Right*


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NIZAM COLLEGE(A)
V-SEM. BASIC MATHEMATICS
(GENERIC ELECTIVE)

Theory: 4 credits and Tutorials: 0 credits Theory: 4 hours /week and Tutorials: 1
hours /week

Generic Elective -V(A)

UNIT-1

Numbers and letter series-coding and decoding-blood relations direction sense -time
and work-trains

UNIT-II

Clocks-calendars-odd man out-data analysis (pie charts& histograms)-data
sufficiency

UNIT-III

**Coordinate Geometry: Fundamentals – Cartesian Coordinates system – Polar
Coordinates – Distance Formula – Section Formula -Centroid of a Triangle – Area
of a Triangle**

UNIT-IV

Matrices: Introduction - Definitions and Notations - Operations on Matrices -
Determinant of a Square Matrix - Non Singular matrix and Singular Matrix - Sarrus
Diagram for Expansion of Determinant of a matrix 3X3 - Properties of
Determinants.(15.1,15.2,15.3,15.5.1,15.5.2,15.5.3 of Chapter 15)

Text: 1. P. Mariappan , Business Mathematics,Pearson Publication 2015, New Delhi.

2.R.S. Aggarwal. A modern Approach to Verbal and Non verbal Reasoning- S Chand

1.14 Mathematics for Economics and Finance

Generic Elective - V(B)

BS:502(B)

Theory: 4 credits and Tutorials: 0 credits
Theory: 4 hours /week and Tutorials: 1 hours /week

Objective: Many models and problems in modern economics and finance can be expressed using the language of mathematics and analysed using mathematical techniques. The aim is to show how a range of important mathematical techniques work and how they can be used to explore and understand the structure of economic models.

Outcome: Student were chiefly interested in learning the mathematics that had applications to economics and finance. Students gain a familiarity with economics and finance principles and are confident in applying them.

Unit- I

Linear Equations: Introduction - Solution of Linear Equations - Solutions of Simultaneous Linear Equations - Graphs of Linear Equations - Budget Lines - Supply and Demand Analysis .

Quadratic Equations: Introduction - Graphs of Quadratic Functions - Quadratic Equations - Applications to Economics.

Unit- II

Functions of a Single Variable: Introduction - Limits - Polynomial Functions - Reciprocal Functions - Inverse Functions. **The Exponential and Logarithmic Functions:** Introduction - Exponential Functions - Logarithmic Functions - Returns to Scale of Production Functions - Compounding of Interest.

Unit- III


Matrices and Determinants: Introduction - Matrix Operations - Solutions of Linear Systems of Equations - Cramer' s Rule - More Determinants - Special Cases.

Unit-IV


Linear Difference Equations: Introduction - Difference Equations - First Order Linear Difference Equations.

Text:

- Vassilis. C. Mavron and Timothy N.Phillips, *Elements of Mathematics for Economics and Finance*, Springer Publishers.


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37


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1.6 Numerical Analysis
(w.e.f. academic year 2021-22)

Theory: 5 credits and Tutorials: 0 credits Theory: 5 hours /week and Tutorials: 1 hours /week

DSE-1F/A

BS:601/A

Theory: 5 credits and Tutorials: 0 credits Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students will be made to understand some methods of numerical analysis.

Outcome: Students realize the importance of the subject in solving some problems of algebra and calculus.

Unit- I

Errors in Numerical Calculations - **Solutions of Equations in One Variable:** The Bisection Method - The Iteration Method - The Method of False Position-Newton's Method - Muller's Method - solution of Systems of Nonlinear Equations.

Unit- II

Interpolation and Polynomial Approximation: Interpolation - Finite Differences - Differences of Polynomials - Newton's formula for Interpolation - Gauss's central differences formulae - Stirling's and Bessel's formula - Lagrange's Interpolation Polynomial - Divided Differences - Newton's General Interpolation formula - Inverse Interpolation.

Unit- III

Curve Fitting: Least Square Curve Fitting: Fitting a Straight Line-Nonlinear Curve Fitting.
Numerical Differentiation and Integration: Numerical Differentiation - Numerical Integration: Trapezoidal Rule-Simpson's 1/3rd-Rule and Simpson's 3/8th-Rule - Boole's and Weddle's Rule - Newton's Cotes Integration Formulae.

Unit- IV

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Picard's Method - Euler's Methods - Runge Kutta Methods.

Text:


- S.S.Sastry, *Introductory Methods of Numerical Analysis*, PHI

References:

- Richard L. Burden and J. Douglas Faires, *Numerical Analysis* (9e)
- M K Jain, S R K Iyengar and R K Jain, *Numerical Methods for Scientific and Engineering computation*
- B.Bradie , *A Friendly introduction to Numerical Analysis*


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1.7 Integral Transforms

(w.e.f. academic year 2021-22)

DSE - 1F/B

BS:601/B

Theory: 5 credits and Tutorials: 0 credits Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students will be exposed to Integral Transforms. The students also learning the Applications of Laplace Transforms to Differential Equations which arises in Physics and Engineering Problems.

Outcome: Students apply their knowledge to solve some problems on special functions and Differential Equations by using the Integral Transforms.

Unit- I

Laplace Transforms-Definition-Existence theorem-Laplace transforms of derivatives and integrals
– Periodic functions and some special functions.

Unit- II

Inverse Transformations - Convolution theorem - Heaviside's expansion formula.

Unit- III

Applications to ordinary differential equations - solutions of simultaneous ordinary differential equations - Applications to Partial differential equations.

Unit- IV

Fourier Transforms- Sine and cosine transforms-Inverse Fourier Transforms.

Text:

• Vasishtha and Gupta, *Integral Transforms*, Krishna Prakashan Media(P), Ltd, Meerut (2e)


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1.8 Analytical Solid Geometry

(w.e.f. academic year 2021-22)

DSE - 1F/C

BS:601/C

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: Students learn to describe some of the surfaces by using analytical geometry.

Outcome: Students understand the beautiful interplay between algebra and geometry.

Unit- I

Sphere: Definition-The Sphere Through Four Given Points-Equations of a Circle- Intersection of a Sphere and a Line-Equation of a Tangent Plane-Angle of Intersection of Two Spheres-Radical Plane.

Unit- II

Cones and Cylinders: Definition-Condition that the General Equation of second degree Represents a Cone-Cone and a Plane through its Vertex -Intersection of a Line with a Cone.

Unit- III

The Right Circular Cone-The Cylinder- The Right Circular Cylinder.

Unit- IV


The Conicoid: The General Equation of the Second Degree-Intersection of Line with a Conicoid-Plane of contact-Enveloping Cone and Cylinder.


Text:

- Shanti Narayan and P K Mittal, *Analytical Solid Geometry* (17e)

References:

- Khaleel Ahmed, *Analytical Solid Geometry*
- S L Loney, *Solid Geometry*
- Smith and Minton, *Calculus*


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1.15 Mathematical Modeling

Project/ Optional - VI

BS:602

Theory: 4 credits and Tutorials: 0 credits
Theory: 4 hours /week and Tutorials: 1 hours /week

Objective: This topic aims to provide the student with some basic modelling skills that will have application to a wide variety of problems.

Outcome: The focus is on those mathematical techniques that are applicable to models involving differential equations, and which describe rates of change. Student realizes some beautiful problems can be modeled by using differential equations. The students also learn how to use the mathematical technique in solving differential equations.

Unit- I

Introduction to Mathematical Modelling: Mathematical Models-Modelling for decision making. **Compartmental Models:**-Exponential decay and radioactivity - Case Study: Detecting art forgeries - Lake Pollution Models - First order Linear Differential Equations - Equilibrium points and stability.

Unit- II

Models of Single Populations: Exponential growth - Density-dependent growth - Limited growth with harvesting. **Interacting Population Models:** Model for an influenza outbreak - **Case Study:** Cholera - Predators and prey - Competing Species.

Unit- III

Formulating Heat and Mass Transport Models: Some basic physical laws -Model for a hot water heater- Heat conduction and Fourier's Law - Heat conduction through a wall - Radiative heat conduction - Diffusion.

Unit- IV

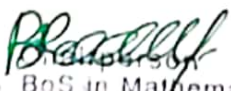
Boundary Value Problems - Heat loss through a wall - Insulating a water pipe - **Introduction to Partial Differential Equations:** The heat conduction equation - Oscillating soil temperatures - **Case study:** Detecting Land Mines - Lake Pollution.

Text:


- 1. B.Barnes and G.R.Fulford, *Mathematical Modelling with Case Studies* 3rd Edition, 2009, CRC press.

References:

- 1. Shepley L. Ross, *"Differential Equations"*.
- 2. I. Sneddon, *Elements of Partial Differential Equations*
- 3. Zafar Ahsan, *"Differential Equations and their Applications"*


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38


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| CBCS COURSE STRUCTURE, NIZAM COLLEGE, OU, HYDERABAD, TELANGANA STATE | | | | | | |
|--|---------|--|---------|---------|------------|----------------------|
| | CODE | COURSE TITLE | HPW | CREDITS | EXAM HOURS | MARKS |
| SEMESTER-I | | | | | | |
| 1 | ELS-1 | English (First Language) | 4 | 4 | 2 hours | 80C+15-I+5A |
| 2 | SLS-1 | Second Language | 4 | 4 | 2 hours | 80C+15-I+5A |
| 3 | AEC-1 | Environmental Science /Human values and Ethics | 2 | 2 | 1½ hours | 40C+10-I |
| 4 | DSC-101 | Differential Equations | 5+2 | 5 | 3 hours | 80C+15I+5A (50T+P) |
| 5 | DSC-102 | Optional-2 | 4+3 (5) | 4+1 (5) | 3 hours | 80C+15I+5A(50P) |
| 6 | DSC-103 | Optional-3 | 4+3 (5) | 4+1 (5) | 3 hours | 80C+15I+5A(50P) |
| | Total | | 28/25 | 25 | | 550/700 |
| SEMESTER-II | | | | | | |
| 7 | ELS-2 | English (First Language) | 4 | 4 | 2 hours | 80C+15-I+5A |
| 8 | SLS-2 | Second Language | 4 | 4 | 2 hours | 80C+15-I+5A |
| 9 | AEC-2 | Environmental Science/ Human values and Ethics | 2 | 2 | 1½ hours | 40C+10-I |
| 10 | DSC-201 | Differential & Integral Calculus | 5+2 | 5 | 3 hours | 80C+15-I+5A (50T+P) |
| 11 | DSC-202 | Optional-2 | 4+2 (5) | 4+1 (5) | 3 hours | 80C+15-I+5A(50P) |
| 12 | DSC-203 | Optional-3 | 4+2 (5) | 4+1 (5) | 3 hours | 80C+15-I+5A(50P) |
| | TOTAL | | 28/25 | 25 | | 550/700 |
| SEMESTER-III | | | | | | |
| 13 | ELS-3 | English (First Language) | 3 | 3 | 2 hours | 80C+15-I+5A |
| 14 | SLS-3 | Second Language | 3 | 3 | 2 hours | 80C+15-I+5A |
| 15 | SEC-1 | | 2 | 2 | 1½ hour | 40C+10-I |
| 16 | SEC-2 | Theory of equations | 2 | 2 | 1½ hour | 40C+10-I |
| 17 | DSC-301 | Real Analysis | 5+2 | 5 | 3 hours | 80C+15-I+5A (50T+P) |
| 18 | DSC-302 | Optional-2 | 4+2 (5) | 4+1 (5) | 3 hours | 80C+15-I+5A(50P) |
| 19 | DSC-303 | Optional-3 | 4+2 (5) | 4+1 (5) | 3 hours | 80C+15-I+5A(50P) |
| | Total | | 28/25 | 25 | | 600/750 |
| SEMESTER-IV | | | | | | |
| 20 | ELS-4 | English (First Language) | 3 | 3 | 2 hours | 80C+15-I+5A |
| 21 | SLS-4 | Second Language | 3 | 3 | 2 hours | 80C+15-I+5A |
| 22 | SEC-3 | | 2 | 2 | 1½ hour | 40C+10-I |
| 23 | SEC-4 | Vector Calculus | 2 | 2 | 1½ hour | 40C+10-I |
| 24 | DSC-401 | Abstract Algebra | 5+2 | 5 | 3 hours | 80C+15-I+5A (50T+P) |

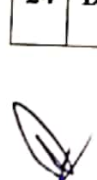
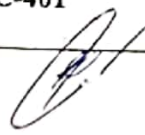
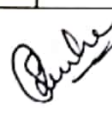
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CBCS COURSE STRUCTURE, NIZAM COLLEGE, OU, HYDERABAD, TELANGANA STATE

| CODE | COURSE TITLE | HPW | CREDITS | EXAM HOURS | MARKS |
|---------------------|--------------|--|---------|------------|-----------------------------------|
| SEMESTER-I | | | | | |
| 1 | ELS-1 | English (First Language) | 4 | 4 | 2 hours 80C+15-I+5A |
| 2 | SLS-1 | Second Language | 4 | 4 | 2 hours 80C+15-I+5A |
| 3 | AEC-1 | Environmental Science /Human values and Ethics | 2 | 2 | 1½ hours 40C+10-I |
| 4 | DSC-101 | Differential Equations | 5+2 | 5 | 3 hours 80C+15I+5A (50T+P) |
| 5 | DSC-102 | Optional-2 | 4+3 (5) | 4+1 (5) | 3 hours 80C+15I+5A(50P) |
| 6 | DSC-103 | Optional-3 | 4+3 (5) | 4+1 (5) | 3 hours 80C+15I+5A(50P) |
| | Total | | 28/25 | 25 | 550/700 |
| SEMESTER-II | | | | | |
| 7 | ELS-2 | English (First Language) | 4 | 4 | 2 hours 80C+15-I+5A |
| 8 | SLS-2 | Second Language | 4 | 4 | 2 hours 80C+15-I+5A |
| 9 | AEC-2 | Environmental Science/ Human values and Ethics | 2 | 2 | 1½ hours 40C+10-I |
| 10 | DSC-201 | Differential & Integral Calculus | 5+2 | 5 | 3 hours 80C+15-I+5A (50T+P) |
| 11 | DSC-202 | Optional-2 | 4+2 (5) | 4+1 (5) | 3 hours 80C+15-I+5A(50P) |
| 12 | DSC-203 | Optional-3 | 4+2 (5) | 4+1 (5) | 3 hours 80C+15-I+5A(50P) |
| | TOTAL | | 28/25 | 25 | 550/700 |
| SEMESTER-III | | | | | |
| 13 | ELS-3 | English (First Language) | 3 | 3 | 2 hours 80C+15-I+5A |
| 14 | SLS-3 | Second Language | 3 | 3 | 2 hours 80C+15-I+5A |
| 15 | SEC-1 | | 2 | 2 | 1½ hour 40C+10-I |
| 16 | SEC-2 | Theory of equations | 2 | 2 | 1½ hour 40C+10-I |
| 17 | DSC-301 | Real Analysis | 5+2 | 5 | 3 hours 80C+15-I+5A (50T+P) |
| 18 | DSC-302 | Optional-2 | 4+2 (5) | 4+1 (5) | 3 hours 80C+15-I+5A(50P) |
| 19 | DSC-303 | Optional-3 | 4+2 (5) | 4+1 (5) | 3 hours 80C+15-I+5A(50P) |
| | Total | | 28/25 | 25 | 600/750 |
| SEMESTER-IV | | | | | |
| 20 | ELS-4 | English (First Language) | 3 | 3 | 2 hours 80C+15-I+5A |
| 21 | SLS-4 | Second Language | 3 | 3 | 2 hours 80C+15-I+5A |
| 22 | SEC-3 | | 2 | 2 | 1½ hour 40C+10-I |
| 23 | SEC-4 | Vector Calculus | 2 | 2 | 1½ hour 40C+10-I |
| 24 | DSC-401 | Abstract Algebra | 5+2 | 5 | 3 hours 80C+15-I+5A (50T+P) |

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Nizam College (Autonomous)

Model Question Paper for Internal Examination

Marks: 15

Time: 45 Min

I. Fill in the blanks (10X $\frac{1}{2}$ = 5)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Multiple Choice Questions (10X $\frac{1}{2}$ = 5)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

III. Short Answer Questions (5X1=5)

- 1.
- 2.
- 3.
- 4.
- 5.



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Prof. B. Surender Reddy
Head, Department of Mathematics
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NIZAM COLLEGE (AUTONOMOUS):: OSMANIA UNIVERSITY
Model Theory Question Paper (I, II – Sem.)

Subject:

Duration of the Examination: 3 hrs

Paper:

Maximum Marks: 80

Section – A (4 X 6=24 Marks)
(Short Answer question)

1. Unit - I
2. Unit - II
3. Unit - III
4. Unit - IV

Section – B (4 X 14 = 56 Marks)
(Essay Questions)

5. (a) UNIT-I

(b)

(OR)

6. (a) UNIT-II

(b)

(OR)

7. (a) UNIT-III


(b)

(OR)

8. (a) UNIT-IV


(b)

(OR)


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Department of Mathematics
University College of Science






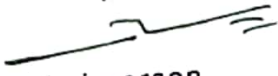

Text:

- Shanti Narayan, P.K. Mittal *Differential Calculus, S.CHAND, NEW DELHI*
- Shanti Narayan *Integral Calculus, S.CHAND, NEW DELHI*

References:

- William Anthony Granville, Percy F Smith and William Raymond Longley; *Elements of the differential and integral calculus*
- Joseph Edwards , *Differential calculus for beginners*
- Smith and Minton, *Calculus*
- Elis Pine, *How to Enjoy Calculus*
- Hari Kishan, *Differential Calculus*


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CBCS -Syllabus

Physics
B.Sc. (M.P.C. & M.P.E)
(For the Students admitted in 2019-20 & onwards)



Department of Physics
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Osmania University
Hyderabad – 500 001

NIZAM COLLEGE (AUTONOMOUS)
CBCS Pattern for Undergraduate B.Sc. Program

Semester I to VI: Academic year 2019-20 onwards

| Semester | Courses | Hours per week | Duration of Exam Hrs | Marks | | | No. of Credits |
|--------------|---|----------------|----------------------|----------|----------|-------|----------------|
| | | | | Internal | External | Total | |
| SEM-I | Theory | | | | | | |
| | DSC-102: (Paper-1) Paper – I : Mechanics & Oscillations | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals | | | | | | |
| | DSC-102: Practicals – I : Mechanics & Oscillations (Lab-1) | 3 | 3 | | 50 | 50 | 1 |

| | | | | | | | |
|---------------|---|---|---|----|----|-----|---|
| SEM-II | Theory | | | | | | |
| | DSC-202: (Paper-2) Paper – II: Thermal Physics | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals | | | | | | |
| | DSC-202: Practicals – II : Thermal Physics (Lab 2) | 3 | 3 | | 50 | 50 | 1 |

| | | | | | | | |
|----------------|---|---|------|----|----|-----|---|
| SEM III | Theory | | | | | | |
| | DSC-302: (Paper-3) Paper – III : Electromagnetic Theory | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals | | | | | | |
| | DSC-302: Practicals – III : Electromagnetic Theory (Lab-3) | 3 | 3 | | 50 | 50 | 1 |
| | SEC –1 BIOMEDICAL INSTRUMENTATION | 2 | 11/2 | 10 | 40 | 50 | 2 |

| | | | | | | | |
|---------------|---|---|------|----|----|-----|---|
| SEM IV | Theory | | | | | | |
| | Paper – IV : Waves & Optics | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals | | | | | | |
| | DSC-402: Practicals – IV :Waves & Optics (Lab-4) | 3 | 3 | | 50 | 50 | 1 |
| | SEC – 2: Digital Electronics | 2 | 11/2 | 10 | 40 | 50 | 2 |

| SEM V | Theory | Hours/ week | Duration of Exam HRS | Internal marks | External marks | Total marks | No. of credits |
|--------------|--|------------------------|---------------------------------|---------------------------|---------------------------|------------------------|---------------------------|
| | DSE-502(A):. Modern Physics (Paper-5) | 4 | 3 | 20 | 80 | 100 | 4 |
| | DSE-502(B): (Paper-5) Computational Physics | 4 | 3 | 20 | 80 | 100 | 4 |
| | GE: Generic Elective Renewable Energy & Energy Harvesting | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals: | | | | | | |
| | DSE-502(A): Modern Physics Lab (Lab 5) | 3 | 3 | | 50 | 50 | 1 |
| | DSE-502(B): Lab-5 Computational Physics | 3 | 3 | | 50 | 50 | 1 |

| Semester | Courses | Hours per week | Duration of Exam Hrs | Marks | | | No. of Credits |
|----------|---|----------------|----------------------|-----------------|----------|-------|----------------|
| | | | | Internal | External | Total | |
| SEM VI | Theory | | | | | | |
| | DSE-602(A):(Paper-6) Electronics | 4 | 3 | 20 | 80 | 100 | 4 |
| | DSE-602(B)(Paper-6) Applied Optics | 4 | 3 | 20 | 80 | 100 | 4 |
| | Project Report / | 4 | 11/2 | 15 VV+ 10 PR | 75 | 100 | 4 |
| | Optional Paper | 4 | 3 | 20 | 80 | 100 | 4 |
| | Practicals | | | | | | |
| | DSE-602(A): (Lab 6) Electronics Lab | 3 | 3 | | 50 | 50 | 1 |
| | DSE-602(B): Lab 6 Applied Optics | 3 | 3 | | 50 | 50 | 1 |

| SNO | COURSE CATEGORY | NO OF COURSES | CREDITS PER COURSE | TOTAL CREDITS |
|----------------------|-----------------|---------------|--------------------|---------------|
| 1 | SEC | 2 | 2 | 4 |
| 2 | GE | 1 | 4 | 4 |
| 3 | PROJECT | 1 | 4 | 4 |
| 4 | DSC | 4 | 4+1 | 20 |
| 5 | DSE | 4 | 4+1 | 20 |
| TOTAL CREDITS | | | | 52 |

CC: Core Course DSC: Discipline Specific Course, DSE: Discipline Specific Elective, VV: Viva –Voce, PR: Presentation

B.Sc. (Physics)- I Year
Semester – I
Paper – I: Mechanics and Oscillations
(DSC - Compulsory)

Total: 60 Hrs
(15 Hrs)

Unit – I

Vector Analysis

Scalar and Vector fields, Gradient of a Scalar field and its physical significance. Divergence and Curl of a Vector field and related problems. Vector integration, line, surface and volume integrals. Stokes', Gauss's and Green's theorems- simple applications.

Unit – II

(15 Hrs)

Mechanics of Particles (8)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

Mechanics of Rigid Bodies (7)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

Unit – III

(15 Hrs)

Central Forces (8)

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws.

Special theory of Relativity (7)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

Unit – IV

(15 Hrs)

Oscillations

Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum measurements of rigidity modulus, compound pendulum, measurement of g, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Note: Problems should be solved at the end of every chapter of all units.

Suggested books :

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*
2. **Fundamentals of Physics.** Halliday/Resnick/Walker *Wiley India Edition 2007.*
3. **First Year Physics** - *Telugu Academy.*
4. **Introduction to Physics for Scientists and Engineers.** F.J. Ruche. *McGraw Hill.*
5. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
6. **Theory of relativity - Resnick**
7. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company Edition, 2008.*
8. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
9. **An introduction to Mechanics** by Daniel Kleppner& Robert Kolenkow. *The McGraw Hill Companies.*
10. **Mechanics.** Hans &Puri. *TMH Publications.*

B.Sc. (Physics) – I year
Semester - I
Paper – I: Mechanics and Oscillations Practicals
(DSC - Compulsory)

1. Measurement of errors –simple Pendulum.
2. Calculation of slope and intercept of a $Y = mX + C$ graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Y by uniform Bending
5. Y by Non-uniform Bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity moduli by torsion Pendulum.
8. Determine surface tension of a liquid through capillary rise method.
9. Determination of Surface Tension of a liquid by any other method.
10. Determine of Viscosity of a fluid.
11. Observation of Lissajous figures from CRO-Frequency ratio. Amplitude and phase difference of two waves.
12. Study of oscillations of a mass under different combination of springs-Series and parallel
13. Study of Oscillations under Bifilar suspension-Verification of axis theorems

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books

1. D.P. Khandelwal, “**A laboratory manual for undergraduate classes**” (Vani Publishing House, New Delhi).
2. S.P. Singh, “**Advanced Practical Physics**” (Pragati Prakashan, Meerut).
3. Worsnop and Flint- **Advanced Practical physics for students.**
4. “**Practical Physics**” R.K Shukla, Anchal Srivastava.

B.Sc. (Physics) - I Year
Semester – II
Paper – II: Thermal Physics
(DSC - Compulsory)

Total: 60 Hrs
(15 Hrs)

Unit – I

Kinetic theory of gases (6)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

Thermodynamics (9)

Basics of Thermodynamics- Carnot's engine (qualitative)-Carnot's theorem -Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

(15 Hrs)

Thermodynamic potentials and Maxwell's equations (8)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

Low temperature Physics (7)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

(15 Hrs)

Quantum theory of radiation

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from Planck's law. Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyro heliometer - determination of solar constant, effective temperature of sun.

Unit – IV

(15 Hrs)

Statistical Mechanics

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles ,classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested books:

1. **Fundamentals of Physics.** Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **Second Year Physics** – *Telugu Academy.*
3. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath (for statistical Mechanics)
S. Chand & Co.
4. **Modern Physics** by G. Aruldas and P. Rajagopal, *Eastern Economy Education.*
5. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
6. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition.*
7. **Thermodynamics** by R.C. Srivastava, Subit K. Saha & Abhay K. *Jain Eastern Economy Edition.*
8. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
9. B.B. Laud “**Introduction to statistics Mechanics**”(Macmillan 1981)

B.Sc. (Physics) – I year
Semester - II
Paper – II: Thermal Physics Practicals
(DSC - Compulsory)

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific heat of a solid (graphite rod)

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- **Advanced Practical physics for students.**
4. "Practical Physics" R.K Shukla, Anchal Srivastava

B.Sc. (Physics) - II Year
Semester – III
Paper – III: Electromagnetic Theory
(DSC - Compulsory)

Total: 60 Hrs

Unit I : Electrostatics

(15 Hrs)

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field 'E', Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics

(15Hrs)

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction and Electromagnetic waves

(15 Hrs)

Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction. Continuity equation, modification of Ampere's law, displacement current, Maxwell equations. Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium. Poynting's theorem.

UNIT IV:

(15 Hrs)

Varying and alternating currents (8)

Growth and decay of currents in LR, CR and LCR circuits - Critical damping. Alternating current, relation between current and voltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit - Q-factor. AC & DC motors-single phase, three phase (basics only).

Network Theorems (7)

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Suggested books:

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Telugu Academy
3. Electricity and magnetism by J.H.Fewkes& John Yarwood. Vol.I (Oxford Univ. Press, 1991).
4. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).
5. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
6. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
7. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

B.Sc. (Physics) – II year
Semester - III
Paper – III: Electromagnetic Theory Practicals
(DSC - Compulsory)

PHYSICS LABORATORY

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.
12. LR circuit
13. RC circuit
14. LCR series circuit
15. LCR parallel circuit

Note: Minimum of eight experiments should be performed.

Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested books:

1. B. L. Worsnop and H. T. Flint, **Advanced Practical Physics**, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of **Practical Physics**, KitabMahal

B.Sc. (Physics) – II
Semester –III
SKILL ENHANCEMENT COURSE

BIOMEDICAL INSTRUMENTATION

(Credits: 02)

Total: 30 Hrs

Unit I

(15 Hrs)

FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

Unit II

(15 Hrs)

ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

IMAGING MODALITIES AND ANALYSIS

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images.

LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books:

1. R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata Mc Graw Hill
2. J. G. Webster, Medical Instrumentation, Application and Design, John Wiley and Sons

B.Sc. (Physics) - II Year
Semester – IV
Paper – IV: Waves and Optics
(DSC - Compulsory)

Total: 60 Hrs

Unit I: Waves

(15 Hrs)

Fundamentals of Waves -Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end.

Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

Unit II: Interference

(15 Hrs)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1, D_2 lines and thickness of a thin transparent plate.

Unit III: Diffraction

(15 Hrs)

Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

Unit IV: Polarization

(15 Hrs)

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested books:

1. **Optics** by Ajoy Ghatak. *The McGraw-Hill companies.*
2. **Optics** by Subramaniam and Brijlal. *S. Chand & Co.*
3. **Second Year Physics** – *Telugu Academy.*
4. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
5. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
6. K. Ghatak, **Physical Optics**
7. D.P. Khandelwal, **Optical and Atomic Physics** (Himalaya Publishing House, Bombay,1988)
8. Jenkins and White: **Fundamental of Optics** (McGraw-Hill)
9. Smith and Thomson: **Optics** (John Wiley and sons).

B.Sc. (Physics) – II year
Semester - IV
Paper – IV: Waves and Optics Practicals
(DSC - Compulsory)

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar-Melde's experiment

Note: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested books:

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- **Advanced Practical physics for students.**
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

B.Sc. (Physics) – II
Semester: IV
SKILL ENHANCEMENT COURSE
DIGITAL ELECTRONICS

(Credits: 02)

Total: 30 Hrs

Unit I

(15 Hrs)

Number Systems: Decimal, Binary, Octal and Hexadecimal.

Conversion: Binary to Decimal, Octal to Decimal, Hexadecimal to Decimal, Decimal to Binary, Decimal to Octal and Decimal to Hexadecimal.

Binary coded decimal, Excess-3 code, grey code, ASCII code.

Logic Gates: OR, AND, NOT, EX-OR, NAND, NOR, Universal gates.
Half adder and Full adder.

Unit II

(15 Hrs)

Boolean algebra: Boolean laws, DeMorgan's theorems, Sum of products, Product of sums and Karnaugh maps. Multiplexers and Demultiplexers.

Flip-Flops: RS flip-flop, D flip-flop, JK flip-flop and MS flip-flop.

Registers: Types of registers

Counters: Synchronous and Asynchronous counters and their differences.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books:

1. Digital Electronics by Gothman
2. Digital principles and applications by Malvino and Leach

**B.Sc. (Physics) - III Year
Semester –V
Renewable Energy Resources
(General Elective)**

Total: 60 Hrs

Unit I: Principles of Solar Radiation and Collection (Qualitative only) (15 Hrs)

Non-renewable energy resources – Principles of power generation and transmission. A model of conventional thermal power plant. Advantages and disadvantages of conventional power plants. Role and potential of new and renewable sources, the solar energy option, environmental impact of solar power, physics of the sun, the solar constant, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Unit II: Solar Energy Storage and Applications: (15 Hrs)

Solar energy collectors - Flat plate and concentration collectors, classification of concentration collectors and orientation, advanced collectors. Different sensible, latent heat and stratified storage, solar ponds. Solar Applications – solar heating/ cooling technique, solar distillation and drying, photovoltaic energy conversion.

Unit III: Wind and Bio-Mass Energy: (15 Hrs)

Resources and potentials, horizontal and vertical axis windmills, performance characteristics. Principles of Bio-Conversion, Energy from waste, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, LPG and CNG.

Unit IV: Geothermal and Ocean Energy: (15 Hrs)

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants, land and their economics.

Suggested books:

1. Non-Conventional Energy Sources - G.D Rai, Khanna Publishers 2. Renewable Energy Resources- Twidell & Wier, CRC Press (Taylor & Francis)

2. Renewable energy resources - Tiwari and Ghosal, Narosa. 2. Renewable Energy Technologies - Ramesh & Kumar, Narosa 3. Non-Conventional Energy Systems - K Mittal, Wheeler 4. Renewable energy sources and emerging technologies by D.P. Kothari, K.C. Singhal.

B.Sc. (Physics) - III Year
Semester – V
Paper – V: (A) Modern Physics
(DSE – Elective I)

Total:60 Hrs
(15 Hrs)

UNIT - 1: SPECTROSCOPY

Atomic Spectra: Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits - relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules - spectra of alkali atoms, doublet fine structure, Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman Effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

UNIT – II: QUANTUM MECHANICS

(15Hrs)

Inadequacy of classical Physics: Spectral radiation - Planck's radiation law (only discussion). Photoelectric effect - Einstein's photoelectric equation. Compton's effect - experimental verification.

Matter waves & Uncertainty principle: de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

Schrodinger Wave Equation: Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values.

Unit – III: NUCLEAR PHYSICS

(15 Hrs)

Nuclear Structure: Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models- liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger - Nuttal law. Gammow's theory of alpha decay (Qualitative). Geiger - Nuttal law from Gammow's theory. Classification of beta decay, Beta spectrum - neutrino hypothesis,

Particle Detectors: GM counter, proportional counter, scintillation counter.

UNIT- IV: SOLID STATE PHYSICS & CRYSTALLOGRAPHY

(15 Hrs)

Crystal Structure : Crystalline nature of matter. Space lattice, Unit Cell, Crystal systems, Bravais lattices. Atomic packing fraction of SC, BCC, FCC, Simple crystal structures of CsCl, NaCl, diamond and Zinc Blende), Miller indices.

X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

Bonding in Crystals: Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals - determination of Madelung constant for NaCl crystal. Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

Suggested books:

1. Modern Physics by G. Aruldas & P. Rajagopal. Eastern Economy Edition.
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Nuclear Physics by D.C. Tayal, Himalaya Publishing House.
5. Molecular Structure and Spectroscopy by G. Aruldas. Prentice Hall of India, New Delhi.
6. Spectroscopy - Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand - Himalaya Publishing House.
7. Third Year Physics - Telugu Academy.
8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials) - Prentice-hall of India Pvt. Ltd.

B.Sc. (Physics) – III year
Semester – V
Paper - V: A. Modern Physics Practicals
(DSE)

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck's constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg's constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Suggested books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal

Note: *Minimum of eight experiments should be performed.*

B.Sc. (Physics) - III Year
Semester – V
Paper – V: B Computational Physics
(DSE – Elective II)

Total: 60 Hrs
(15Hrs)

Unit I

Programming in C

Flow charts, Algorithms, Integer and floating point arithmetic, Precision, Variable types, Arithmetic statements, Input and output statements, Control statements, Executable and non-executable statements, Arrays, Repetitive and logical structures, Subroutines and functions, Operation with files, Operating systems, Creation of executable programs.

UNIT II

(15Hrs)

Numerical Methods of Analysis:

Solution of algebraic and transcendental equations: Iterative, bisection and Newton-Raphson methods, Solution of simultaneous linear equations: Matrix inversion method, **Interpolation:** Newton and Lagrange formulas, Numerical differentiation, Numerical Integration, Trapezoidal, Simpson and Gaussian quadrature methods, Least-square curve fitting, Straight line and polynomial fits

UNIT III

(15 Hrs)

Numerical solution of ordinary differential equations: Euler and Runge - Kutta methods, Simulation Generation of uniformly distributed random integers, Statistical tests of randomness, Monte-Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance of sampling, Rejection method

Unit IV

(15 Hrs)

Metropolis algorithm, Molecular diffusion and Brownian motion as random walk problems and their Monte Carlo simulation.

Finite element and finite difference methods, boundary value and initial value problems, density functional methods.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books:

1. Computational Methods in Physics and Engineering: Wong.
2. Computer Oriented Numerical Methods: Rajaraman.
3. Computer Programming in FORTRAN 77: Rajaraman.
4. Applied Numerical Analysis: Gerald.
5. A Guide to Monte Carlo Simulations in Statistical Physics: Land

B.Sc. (Physics) - III Year
Semester – V
Paper – V: B Computational Physics Practicals
(DSE – Elective II)

1. Jacobi Method of Matrix Diagonalization
2. Solution of transcendental or polynomial equations by the Newton Raphson method
3. Linear curve fitting and calculation of linear correlation coefficient
4. Matrix summation, subtraction and multiplication
5. Matrix inversion and solution of simultaneous equation
6. Lagrange interpolation based on given input data
7. Numerical integration using the Simpson's method
8. Numerical integration using the Gaussian quadrature method
9. Solution of first order differential equations using the Runge-Kutta method
10. Numerical first order differentiation of a given function
11. Fast Fourier Transform
12. Monte Carlo integration
13. Use of a package for data generation and graph plotting.
14. Test of randomness for random numbers generators

Note: *Minimum of eight experiments should be performed.* Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

B.Sc. (Physics) - III Year
Semester – VI
Paper – VI: A. Electronics
(DSE- Elective I)

Total: 60 Hrs
(15 Hrs)

Unit I

Band theory of P-N junction

Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semiconductors and pure or intrinsic semiconductors and impure or extrinsic semiconductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation. Carrier concentration in intrinsic, P – type and N – type (qualitative)

Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit II

(15 Hrs)

Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier - RC coupled amplifier – Frequency response (Qualitative analysis).

Feedback concept & Oscillators: Feedback, General theory of feedback – Concepts of oscillators, Barkhausen's criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit III

(15 Hrs)

Special devices- Construction and Characteristics: Photo diode - Shockley diode - Solar cell, Opto-couplers - Field Effect Transistor (FET) - FET as an Amplifier - Uni Junction Transistor (UJT), UJT as a relaxation oscillator - Silicon controlled rectifier (SCR) - SCR as a switch.

Unit IV

(15 Hrs)

Digital Electronics

Binary number system, conversion of binary to decimal and vice-versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan's Laws – Verification. Half – adder, Full – adder.

NOTE: Problems should be solved from every chapter of all units.

Suggested books:

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , S. Chand & Co.
4. A First Course in Electronics- Anwar A. Khan & Kanchan K. Dey, PHI.
5. Physics of Semiconductor Devices- S. M. Sze
6. Physics of Semiconductors- Streetman.
7. Basic Electronics – Bernod Grob.
8. Third year Electronics – Telugu Academy
9. Digital Principles & Applications – A.P. Malvino and D.P. Leach

B.Sc. (Physics) – III year
Semester – VI
Paper: VI: A. Electronics Practicals

1. Construction of logic gates (AND, OR, NOT, gates) with discrete components – Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Construction of NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan's Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

Note: Every student should complete minimum of 08 experiments.

Suggested books:

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

B.Sc. (Physics) - III Year
Semester – VI
Paper-VI: B. APPLIED OPTICS
(DSE- Elective-II)

Total: 60 Hrs
(15 Hrs)

Unit I

Principles of Lasers: Emission and absorption of Radiation – Einstein Relations. Properties of Laser, Pumping Mechanisms – Optical feedback - Classification of laser systems – Gas, Liquid and Solid Lasers: He- Ne and Argon lasers, their energy level schemes - YAG laser, GA-As laser and their applications in various fields.

Unit II **(15 Hrs)**

Holography: Basic Principles of Holography- Recording of amplitude and phase- The recording medium- Reconstruction of original wave front- Image formation by wave front reconstruction- Gaber Hologram- Limitations of Gaber Hologram-Off axis Hologram- Fourier transform Holograms- Volume Holograms, Applications of Holograms.

Unit III **(15 Hrs)**

Fourier and Non-Linear Optics: Fourier optics- Thin lens as phase transformation – Thickness function- Various types of lenses- Fourier transforming properties of lenses – Object placed in front of the lens- Object placed behind the lens.

Non-Linear Optics: Harmonic generation- Second harmonic generation- Phase matching Condition - Optical mixing- Parametric generation of light – Self focusing of light.

Unit IV **(15 Hrs)**

Optical Fibers: Fiber types and their structures. Ray optics representation, acceptance angle and numerical aperture. Step index and graded index fibers, single mode and multimode fibers. Fiber Materials for glass fibers and plastic fibers. Signal attenuation in optical fibers: Absorption, scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, intermodes distortion and pulse broadening, Fiber drawing methods.

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested books:

1. Opto Electronics- An Introduction – Wilson & JFB Hawkes 2nd Edition.
2. Introduction to Fourier optics – J.W. Goodman
3. Lasers and Non-Linear optics – B.B. Laud
4. Optical Electronics – Ghatak and Thyaga Rajan.
5. Principles of Lasers – O. Svelto
6. Optical Fiber Communications – by Gerard Keiser
7. Optical Fiber Communications – by John M. Senior (PHI)

B.Sc (Physics)
Semester VI
(DSE- Elective-II)
Paper-VI: B. APPLIED OPTICS Practicals

1. Study of the profile of a laser beam.
2. Determination of the diameter of a thin wire using laser.
3. Determination of wavelength of He-Ne laser by transmission grating.
4. Construction and recording of a hologram.
5. Study of Fourier transforming properties of lenses.
6. Study of second harmonic generation by KDP crystal.
7. Measurement of numerical aperture of an optical fiber.
8. Measurement of coupling losses in optical fibers.
9. Measurement of bending losses in optical fibers.
10. Study of audio signal transmission through optical fibers.
11. To study the interference of light using optical fibers.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested books:

1. Introduction to Fourier Optics – J. Goodman
2. Optical Fiber Communications- John M. Senior
3. Principles of Lasers- O. Svelto
4. Modern Optics- Grant Fowles.
5. Principles of Optics – Born & Wolf
6. Fundamentals of Optics- Jenkins & White

**PAPER IN LIEU OF PROJECT
NANO SCIENCE**

(Credits: 04)

Total: 60 Hrs

Unit I (15 Hrs)

Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, Size Effects in nano systems, Quantum confinement in 3D, 2D, 1D nanostructures and its consequences.

Unit II (15 Hrs)

SYNTHESIS OF NANOSTRUCTURE MATERIALS: Top down and Bottom up approach, Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition. Chemical vapor deposition (CVD). Sol-Gel. Electro deposition. Spray pyrolysis. Hydrothermal synthesis. Preparation through colloidal methods. MBE growth of quantum dots.

CHARACTERIZATION: X-Ray Diffraction. Optical Microscopy. Scanning Electron Microscopy. Transmission Electron Microscopy. Atomic Force Microscopy. Scanning Tunneling Microscopy.

Unit III (15 Hrs)

OPTICAL PROPERTIES: Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals.

Quantitative treatment of quasi-particles and excitons, charging effects. Radiative processes: General formalization-absorption, emission and luminescence. Optical properties of heterostructures and nanostructures.

ELECTRICAL TRANSPORT PROPERTIES: Carrier transport in nano structures. Coulomb blockade effect, thermionic emission, tunneling and hopping conductivity. Defects and impurities: Deep level and surface defects.

Unit IV (15 Hrs)

APPLICATIONS: Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Single electron devices (no derivation).

CNT based transistors. Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots - magnetic data storage. Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS).

NOTE: Problems should be solved at the end of every chapter of all units.

Suggested books:

1. C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
2. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publishing Company)
3. K.K. Chattopadhyay and A. N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited).
4. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).
5. M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier, 2007).
6. Bharat Bhushan, Springer Handbook of Nanotechnology (Springer -Verlag, Berlin, 2004).



Nizam College

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A Constituent College of Osmania University



Department of Chemistry

B.Sc. Chemistry, I Year, CBCS Syllabus

**PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.Sc., Chemistry (for the batch admitted in 2019-20)**

| CBCS COURSE STRUCTURE, NIZAM COLLEGE, OU, HYDERABAD, TELANGANA STATE | | | | | | |
|--|--------------|--|---------|------------|----------|------------------|
| CODE | COURSE TITLE | HPW | CREDITS | EXAM HOURS | MARKS | |
| SEMESTER-I | | | | | | |
| 1 | ELS-1 | English (First Language) | 4 | 4 | 2hrs | 80C+15-I+5A |
| 2 | SLS-1 | Second Language | 4 | 4 | 2hrs | 80C+15-I+5A |
| 3 | AEC-1 | Environmental Science / Human values and Ethics | 2 | 2 | 1 1/2hrs | 40C+10-I |
| 4 | DSC-101 | Optional-1 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 5 | DSC-102 | Optional-2 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 6 | DSC-103 | Optional-3 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| Total | | | 31 | 25 | | 550+150P |
| SEMESTER-II | | | | | | |
| 7 | ELS-2 | English (First Language) | 4 | 4 | 2hrs | 80C+15-I+5A |
| 8 | SLS-2 | Second Language | 4 | 4 | 2hrs | 80C+15-I+5A |
| 9 | AEC-2 | Environmental Science / Human values and Ethics | 2 | 2 | 1 1/2hrs | 40C+10-I |
| 10 | DSC-201 | Optional-1 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15-I+5A(50P) |
| 11 | DSC-202 | Optional-2 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15-I+5A(50P) |
| 12 | DSC-203 | Optional-3 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15-I+5A(50P) |
| Total | | | 31 | 25 | | 550+150P |

Syllabus Approved

CHAIRMAN
Board of Studies in Chemis. v
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Osmania University, Hyd-07

① By /s/ (Prof. U. UMESH KUMAR, BSc)

② Head
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Dr. B. S. AERAM

③ P. ... /s/ (Prof. P. ...)

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Department of Chemistry

**PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.Se., Chemistry (for the batch admitted in 2020-21)**

2019-20

| CBCS COURSE STRUCTURE, NIZAM COLLEGE, OU, HYDERABAD, TELANGANA STATE | | | | | | |
|--|--------------|--------------------------|---------|------------|-------|-----------------|
| CODE | COURSE TITLE | HPW | CREDITS | EXAM HOURS | MARKS | |
| SEMESTER-III | | | | | | |
| 1 | ELS-3 | English (First Language) | 3 | 3 | 2hrs | 80C+15-I+5A |
| 2 | SLS-3 | Second Language | 3 | 3 | 2hrs | 80C+15-I+5A |
| 3 | SEC-1 | | 2 | 2 | 1½hrs | 40C+10-I |
| 4 | SEC-2 | | 2 | 2 | 1½hrs | 40C+10-I |
| 5 | DSC-301 | Optional-1 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 6 | DSC-302 | Optional-2 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 7 | DSC-303 | Optional-3 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| Total | | | 31 | 25 | | 600+150P |
| SEMESTER-IV | | | | | | |
| 7 | ELS-4 | English (First Language) | 3 | 3 | 2hrs | 80C+15-I+5A |
| 8 | SLS-4 | Second Language | 3 | 3 | 2hrs | 80C+15-I+5A |
| 9 | SEC-3 | | 2 | 2 | 1½hrs | 40C+10-I |
| 10 | SEC-4 | | 2 | 2 | 1½hrs | 40C+10-I |
| 11 | DSC-401 | Optional-1 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 12 | DSC-402 | Optional-2 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| 13 | DSC-403 | Optional-3 | 4+3(7) | 4+1(5) | 3 hrs | 80C+15I+5A(50P) |
| Total | | | 31 | 25 | 25 | 600+150P |

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B.Sc. I Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER I
Paper – I
Chemistry - I

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S1- I-1. Chemical Bonding

8 h

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions. VSPER Theory - Common hybridization- sp , sp^2 , sp^3 , sp^3d , sp^3d^2 and sp^3d^3 , shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. π and σ overlapping. Concept of Types of molecular orbitals- bonding, antibonding and non bonding. MOED of homonuclear diatomics - H_2 , N_2 , O_2^- , O_2^{2-} , F_2 (unhybridized diagrams only) and heteronuclear diatomics CO , CN^- , NO , NO^+ and HF . Bond order, stability and magnetic properties.

S1-I-2. P-Block Elements 1

7 h

Group-13: Structure of diborane and higher Boranes (B_4H_{10} and B_5H_9), Boron nitrogen compounds ($B_3N_3H_6$ and BN), Lewis acid nature of BX_3 .
Group - 14: Carbides-Classification - ionic, covalent, interstitial - Structures and reactivity. Industrial applications. Silicones - Classification - straight chain, cyclic and cross-linked.
Group - 15: Nitrides - Classification - ionic, covalent and interstitial. Reactivity - hydrolysis. Reactions of hydrazine, hydroxyl amine, phosphazenes.

Unit - II (Organic Chemistry)

15h(1 hr/week)

S1-O-1: Structural Theory in Organic Chemistry

5 h

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance - Mesomeric effect, application to (a) acidity of phenol. (b) acidity of carboxylic acids and basicity of anilines. Stability of carbo cations, carbanions and free radicals. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

S1-O-2: Acyclic Hydrocarbons

6 h

Alkanes- Methods of preparation: From Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. Properties: Anti-addition of halogen and its mechanism. Addition of HX , Markonikov's rule, addition of H_2O , HOX , H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Oxidation (cis - additions) - hydroxylation by $KMnO_4$, OsO_4 ,

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Nizam College
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anti addition- peracids (via epoxidation), hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes– Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Chemical reactivity – electrophilic addition of X_2 , HX, H_2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

Aromatic Hydrocarbons

4h

Introduction to aromaticity: Huckel's rule – Benzene, Naphthalene and Anthracene. Reactions - General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para, and meta directing groups. Ring activating and deactivating groups with examples. Orientation – (i) activating groups: Amino, methoxy and alkyl groups. (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

Unit – III (Physical Chemistry)

15h(1 hr/week)

S1-P-1: Atomic structure and elementary quantum mechanics

3 h

Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck's radiation law, photoelectric effect, Limitations of classical mechanics, Compton effect, de Broglie's hypothesis. Heisenberg's uncertainty principle.

S1-P-2: Gaseous State

5 h

Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO_2 . The van der Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquifaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

S1-P-3: Liquid State and Solutions

4 h

Liquid State

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solutions

3 h

Liquid - liquid mixtures, ideal liquid mixtures, Raoult's and Henry's laws. Non ideal systems. Azeotropes: HCl- H_2O and $C_2H_5OH - H_2O$ systems. Fractional distillation. Partially miscible liquids: Phenol – Water, Trimethyl amine – Water and Nicotine – Water systems.

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Unit - IV (General Chemistry)

15h(1 hr/week)

S1-G-1. General Principles of Inorganic Qualitative Analysis

6 h

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions- CO_3^{2-} , Cl^- , Br^- , SO_4^{2-} , PO_4^{3-} , BO_3^{3-} , CH_3COO^- , NO_3^- . Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations (Hg_2^{2+} , Ag^+ , Pb^{2+}) with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II (Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Sb^{3+}), III (Al^{3+} , Fe^{3+}), IV (Mn^{2+} , Zn^{2+}) individual cations with flow chart and chemical equations. General discussion for the separation and identification of group V individual cations (Ba^{2+} , Sr^{2+} , Ca^{2+}) with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations (Mg^{2+} , NH_4^+).

S1-G-2. Isomerism

5 h

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers - definitions and examples. Representation of stereoisomers - Wedge, Fischer projection, Sawhorse, Newmann formulae.

Conformational analysis : Classification of stereoisomers based on energy. Definition and examples Conformational and configurational isomers. Conformational analysis of ethane, n-butane, 1,2- dichloroethane, 2-chloroethanol .Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane

Cis-trans isomerism: E-Z-Nomenclature

S1-G-3: Solid state Chemistry

4 h

Laws of Crystallography: (i) Law of Constancy of interfacial angles (ii) Law of Symmetry- Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems (a brief review). X-ray diffraction by crystals: Derivation of Bragg's equation. Determination of structure of NaCl, KCl and CsCl (Bragg's method and Powder method).

References

General reference: B.Sc I Year Chemistry : Semester I, Telugu Academy publication, Hyd

Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001. Chem.

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P. Lee

B.S. ...

- Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn.
- Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
- Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
- Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

- Organic Chemistry by Morrison and Boyd.
- Organic Chemistry by Graham Solomons.
- Organic Chemistry by Bruice Yuranis Powla.
- Organic Chemistry by L. G. Wade Jr.
- Organic Chemistry by M. Jones, Jr
- Organic Chemistry by John McMurry.
- Organic Chemistry by Soni.
- General Organic chemistry by Sachin Kumar Ghosh.
- Organic Chemistry by C N pillai

Unit III

- Principles of physical chemistry by Prutton and Marron.
- Text Book of Physical Chemistry by Soni and Dharmahara..
- Text Book of Physical Chemistry by Puri and Sharma.
- Text Book of Physical Chemistry by K. L. Kapoor.
- Physical Chemistry through problems by S.K. Dogra.
- Text Book of Physical Chemistry by R.P. Verma.
- Elements of Physical Chemistry by Lewis Glasstone.

Unit IV

- Qualitative analysis by Welcher and Hahn.
- Vogel's Qualitative Inorganic Analysis by Svehla.
- Text Book of Organic Chemistry by Morrison And Boyd.
- Text Book of Organic Chemistry by Graham Solomons.
- Text Book of Organic Chemistry by Bruice Yuranis Powla.
- Text Book of Organic Chemistry by Soni.
- Text Book of Physical Chemistry by Soni And Dharmahara..
- Text Book of Physical Chemistry by Puri And Sharma.
- Text Book of Physical Chemistry by K. L. Kapoor.

45h (3 h / week)

Laboratory Course

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , PO_4^{3-} , BO_3^{3-} , SO_4^{2-} . .

Cations: Hg_2^{2+} , Ag^+ , Pb^{2+}

Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Cu^{2+} , $As^{3+/5+}$, $Sb^{3+/5+}$, $Sn^{2+/4+}$

Al^{3+} , Cr^{3+} , Fe^{3+}

Zn^{2+} , Ni^{2+} , Co^{2+} , Mn^{2+}

Ba^{2+} , Sr^{2+} , Ca^{2+}

Mg^{2+} , NH_4^+

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B.Sc I Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER II
Paper – II
Chemistry – II

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S2-I-1 P-block Elements -II

7 h

Oxides: Types of oxides (a) Normal- acidic, basic amphoteric and neutral (b) Mixed (c) sub oxide d) peroxide e) superoxide. Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

Oxy acids: Structure and acidic nature of oxyacids of B, C, N, P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO_2 (reaction with FeSO_4 , KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$), HNO_3 (reaction with H_2S , Cu), HNO_4 (reaction with KBr, Aniline), $\text{H}_2\text{N}_2\text{O}_2$ (reaction with KMnO_4). Redox properties of oxyacids of Phosphorus: H_3PO_2 (reaction with HgCl_2), H_3PO_3 (reaction with AgNO_3 , CuSO_4). Redox properties of oxyacids of Sulphur: H_2SO_3 (reaction with KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$), H_2SO_4 (reaction with Zn, Fe, Cu), $\text{H}_2\text{S}_2\text{O}_3$ (reaction with Cu, Au), H_2SO_5 (reaction with KI, FeSO_4), $\text{H}_2\text{S}_2\text{O}_8$ (reaction with FeSO_4 , KI). Redox properties of oxy acids of Chlorine.

Interhalogens- Classification- general preparation- structures of AB , AB_3 , AB_5 and AB_7 type and reactivity.

Poly halides- Definition and structure of ICl_2^- , ICl_4^- and I_3 .

Pseudohalogens: Comparison with halogens.

S2-I-2: Chemistry of Zero group elements

2 h

Isolation of noble gases, Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clathrate compounds and Anomalous behavior of He (II)

S2-I-3: Chemistry of d-block elements

6 h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, ability to form complexes, magnetic properties & catalytic properties. Stability of various oxidation states and standard reduction potentials. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu triads. Titanium triad – electronic configuration and reactivity of +3 and +4 states – oxides and halides. Chromium triad – reactivity of +3 and +6 states. Copper triad – reactivity of +1, +2 and +3 states.

Unit - II (Organic Chemistry)

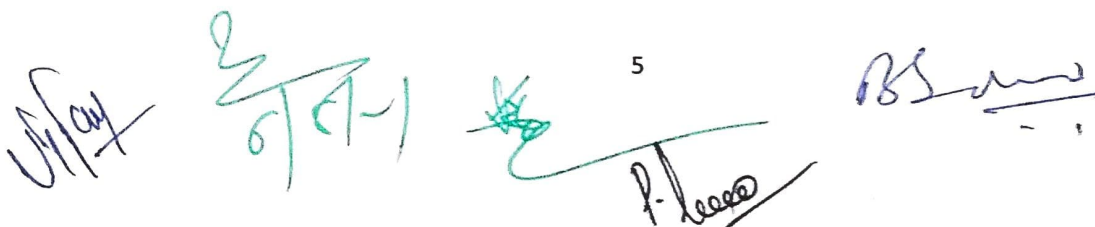
15h(1 hr/week)

S2-O-1: Halogen compounds

4 h

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl. Chemical reactivity - reduction, formation of RMgX , Nucleophilic substitution reactions – classification into $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$. Mechanism and energy profile diagrams of $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. Stereochemistry of $\text{S}_{\text{N}}2$ (Walden Inversion) 2-bromobutane, $\text{S}_{\text{N}}1$ (Racemisation) 1-bromo-1-phenylpropane Structure and reactivity – Ease of hydrolysis - comparison of alkyl, vinyl, allyl, aryl, and benzyl halides.

5



S2-O-2: Hydroxy compounds and ethers

6 h

Alcohols: Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/ZnCl₂ (Lucas reagent), esterification, oxidation with PCC, alk. KMnO₄, acidic dichromates, conc. HNO₃ and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide .

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Reimer Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azo-coupling reaction, Schotten-Boumann reaction, Houben-Hoesch condensation, .

Ethers: Nomenclature, preparation by (a) Williamson's synthesis (b) from alkenes by the action of conc. H₂SO₄. Physical properties – Absence of Hydrogen bonding, insoluble in water, low boiling point. Chemical properties – inert nature, action of conc. H₂SO₄ and HI.

S2-O-3 Carbonyl compounds

5 h

Preparation of aldehydes & ketones from acid chloride, 1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes (b) Hydrolysis of benzal halides Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO₃ (b) HCN (c) RMgX (d) NH₃ (e) RNH₂ (f) NH₂OH (g) PhNHNH₂ (h) 2,4-DNP (Schiff bases). Addition of H₂O to form hydrate , chloral hydrate (stable), addition of alcohols - hemi acetal and acetal formation. Cannizzaro reaction. Oxidation reactions – KMnO₄ oxidation and auto oxidation, reduction – catalytic hydrogenation, mechanism of Clemmenson's reduction, Wolf-kishner reduction, Meerwein Ponnoff Verly reduction. Reduction with LAH, NaBH₄.

Unit - III (Physical Chemistry)

15h(1 hr/week)

S2-P-1: Electrochemistry

15 h

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kohlrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law - its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Computation of EMF. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble

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salt and redox electrodes. Electrode reactions, Nernst equation, cell EMF and Single electrode potential, Standard Hydrogen electrode – reference electrodes (calomel electrode) – standard electrode potential, sign conventions, electrochemical series and its significance. Applications of EMF measurements. Calculation of thermodynamic quantities of cell reactions (Gibbs free energy G , Helmholtz free energy and Equilibrium constant K). Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode. Solubility product of AgCl. Potentiometric titrations.

Unit – IV (General Chemistry)

15 h (1 hr/week)

S2-G-1: Theory of Quantitative Analysis

6 h

Volumetric Analysis: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid –weak base, weak acid-strong base and weak acid –weak base. Theory of redox titrations - internal($KMnO_4$) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

Gravimetric analysis- Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, coprecipitation and post precipitation. Determination of Ni^{2+}

S2-G-2: Stereoisomerism

5 h

Optical activity: Definition, wave nature of light, plane polarised light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans-1,2-dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog rules, examples for asymmetric and dissymmetric molecules.

S2-G-3: Dilute Solutions & Colligative Properties

4 h

Dilute Solutions, Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

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References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd

Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
7. Textbook of inorganic chemistry by R Gopalan.

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6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N Pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati.

Laboratory Course

45hrs (3 h / week)

Paper II- Quantitative Analysis

Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

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4. Estimation of Alkali content in Antacid using HCl.

5. Estimation of NH_4^+ by back titration

Redox Titrations

1. Determination of Fe(II) using $K_2Cr_2O_7$

2. Determination of Fe(II) using $KMnO_4$ with sodium oxalate as primary standard.

3. Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard

Complexometric Titrations

1. Estimation of Mg^{2+}

2. Estimation of Cu^{2+}

B.Sc II Yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER III
Paper-III
Chemistry - III

Unit-I (Inorganic Chemistry)

15 h (1 hr/week)

S3-I-1: Chemistry of f-block elements:

5 h

Chemistry of Lanthanides: Position in periodic table, Electronic structure, oxidation state, ionic and atomic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation- type of donor ligands preferred. Magnetic properties- paramagnetism. Colour and spectra, f-f transitions –occurrence and separation– ion exchange method, solvent extraction.

Chemistry of actinides- general features – electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

S3-I-2: Coordination Compounds-I

6 h

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules, 1. Coordination number, coordination geometries of metal ions, types of ligands. 2. Brief review of Werner's theory, Sidgwick's electronic interpretation and EAN rule and their limitations. (Valence bond theory (VBT) – postulates and application to (a) tetrahedral complexes $[Ni(NH_3)_4]^{2+}$, $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ (b) Square planar complexes $[Ni(CN)_4]^{2-}$, $[Cu(NH_3)_4]^{2+}$, $[PtCl_4]^{2-}$ (c) Octahedral complexes $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$, $[FeF_6]^{4-}$, $[Co(NH_3)_6]^{3+}$, $[CoF_6]^{3-}$. Limitations of VBT. 3. Isomerism in coordination compounds, stereo isomerism – (a) geometrical isomerism in (i) square planar metal complexes of the type $[MA_2B_2]$, $[MA_2BC]$, $[M(AB)_2]$, $[MABCD]$. (ii) Octahedral metal complexes of the type $[MA_4B_2]$, $[M(AA)_2B_2]$, $[MA_3B_3]$ using suitable examples, (b) Optical isomerism in (i). tetrahedral complexes $[MABCD]$, (ii). Octahedral complexes $[M(AA)_2B_2]$, $[M(AA)_3]$ using suitable examples. Structural isomerism: ionization, linkage, coordination ligand isomerism using suitable examples.

S3-I-3: Metal carbonyls and Organometallic Chemistry

4 h

Metal carbonyls: Preparation and properties of $\text{Ni}(\text{CO})_4$. Structural features of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$ and $\text{Cr}(\text{CO})_6$ - 18 valence electron rule. Definition, nomenclature and classification of organometallic compounds. Methods of preparation, properties and applications of alkyl and aryl compounds of Li, Mg & Al.

Unit - II (Organic Chemistry)

15h(1 hr/week)

S3-O-1: Carboxylic acids and derivatives

5 h

Preparation: a) Hydrolysis of Nitriles, amides and esters. b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties - hydrogen bonding, dimeric association, Chemical properties - Reactions involving H, OH and COOH groups - salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol - via ester or acid chloride. Degradation of carboxylic acids by Huns Diecker reaction, Schmidt reaction (Decarboxylation). Arndt - Eistert synthesis, Halogenation by Hell - Volhard - Zelensky reaction. Carboxylic acid Derivatives - Hydrolysis and Amonolysis of acid halides, Acid anhydrides and esters (mechanism of ester hydrolysis by base and acid). Hydrolysis and dehydration of amides.

S3-O-2: Nitrohydrocarbons

3 h

Preparation of Nitroalkanes. Reactivity - halogenation, reaction with HNO_2 (Nitrous acid), Nef reaction, reduction. Aromatic Nitrohydrocarbons: Preparation of Nitrobenzene by Nitration. Physical properties, chemical reactivity - Reduction of Nitrobenzenes in different media.

S3-O-3: Amines, Cyanides and Isocyanides

7 h

Amines: classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods - Ammonolysis of alkyl halides, Gabriel synthesis, Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties. Use of amine salts as phase transfer catalysts. Chemical Properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation. Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines - Bromination and Nitration, oxidation of aryl and 3° Amines, diazotisation. Diazonium salts: Preparation with mechanism. Synthetic importance - a) Replacement of diazonium group by - OH, X (Cl) - Sandmeyer and Gatterman reaction, by fluorine (Schiemann's reaction), by iodine, CN, NO_2 , H and aryl groups. Coupling Reaction of diazonium salts. i) with phenols ii) with anilines. Reduction to phenyl hydrazines.

Cyanides and isocyanides: Structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii)

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reduction iv) oxidation.

Unit III (Physical Chemistry)

15 h (1 hr/week)

S3-P-1: Thermodynamics –I

10 h

A brief review of - Energy, work and heat units, mechanical equivalent of heat, definition of system, surroundings. First law of thermodynamics statement- various forms mathematical expression. Thermodynamic quantities- extensive properties and intensive properties, state function and path functions. Energy as a state function and exact differential. Work of expansion and heat absorbed as path function.

Expression for work of expansion, sign convention problems on first law. Heat changes at constant pressure and heat changes at constant volume. Enthalpy. Heat capacities at constant pressure and constant volume. Derivation of $C_p - C_v = R$. Isothermal adiabatic processes. Reversible and irreversible processes. Reversible change and maximum work. Derivation of expression for maximum work for isothermal reversible process. Problems. Internal energy of an ideal gas. Joules experiment. Joule-Thompson coefficient. Adiabatic changes in ideal gas, derivation of equation, $PV^\gamma = \text{constant}$. P-V curves for isothermal and adiabatic processes. Heat of a reaction at constant volume and at constant pressure, relation between ΔH and ΔV . Variation of heat of reaction with temperature. Kirchhoff's equation and problems. Limitations of first law and need for second law. Statement of second law of thermodynamics. Cyclic process. Heat engine, Carnot's theorem, Carnot's cycle. Derivation of efficiency of heat engine. Problems. Thermodynamic scale of temperature.

S3-P-2: Thermodynamics-II

5 h

Entropy: Definition from Carnot's cycle. Entropy as a state function. Entropy as a measure of disorder. Sign of entropy change for spontaneous and non-spontaneous processes & equilibrium processes. Entropy changes in i). Reversible isothermal process, ii). Reversible adiabatic process, iii). Phase change, iv). Reversible change of state of an ideal gas. Problems. Entropy of mixing of ideal gases. Free energy Gibb's function (G) and Helmholtz's function (A) as thermodynamic quantities. Concept of maximum work and network ΔG as Criteria for spontaneity. Derivation of equation $\Delta G = \Delta H - T\Delta S$. Significance of the equation. Gibbs equations and Maxwell relations. Variation of G with P, V and T.

Unit – IV (General Chemistry)

15 h (1 hr/week)

S3-G-1 Evaluation of analytical data

4 h

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors. Problems based on mean, median, range, standard deviation

S3-G-2: Carbanions-I

5 h

Introduction, acidic nature of α -hydrogens and tautomerism in carbonyl compounds, nitro hydrocarbons, ethyl acetoacetate, diethyl malonate. Terminal alkynes. Stability of carbanions
Reactions : Aldol reaction, Perkin reaction, Benzoin condensation, haloform reaction, conversion of smaller alkynes to higher alkynes.

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S3-G-3: Phase Rule

Statement and meaning of the terms – Phase, Component and Degrees of freedom, Gibb's Phase rule, phase equilibria of one component system – water system. Phase equilibria of two-component system – Solid-Liquid equilibria, simple eutectic –Pb-Ag system, desilverisation of lead. Solid solutions – compound with congruent melting point – Mg-Zn system and incongruent melting point – NaCl-H₂O system.

References

General reference: B.Sc II Year Chemistry : Semester III, Telugu Academy publication, Hyd

Unit- I

1. Analytical chemistry by G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasada Rao, K.L.N. Reddy and C. Sudhakar
2. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications(1996).
3. Concise Inorganic Chemistry by J.D. Lee 3rd edn Van Nostrand Reinhold Company(1977)
4. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
5. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
6. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press(1989).
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
8. Textbook of Inorganic Chemistry by R Gopalan(Universities Press(2012)
9. College Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati Universities Press (India) Limited(2012)

Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008).
3. Text book of organic chemistry by Morrison and Boyd. Person(2009)
4. Text book of organic chemistry by Graham Solomons. Wiley(2015)
5. Text book of organic chemistry by Bruice Yuranis Powla. (2012)
6. Text book of organic chemistry by C N pillai CRC Press (2012)
7. Organic Chemistry by L. G. Wade Jr.
8. Organic Chemistry by M. Jones, Jr
9. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton and Marron. The MacmillanCompany; 4th Edn.(1970)
2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)
3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Colloidal and surface chemistry , M. Satake, Y. Hayashi, Y.Mido, S.A.Iqbal and
6. M.S.sethi, Discovery Publishing Pvt.Ltd (2014)
7. Material science by Kakani & Kakani, New Age International(2016)
8. Physical Chemistry by Ira Levine (Author) McGraw-Hill Education; 6 edition (May 9, 2008)

Unit IV

1. Text book of organic chemistry by Morrison and Boyd, Person(2009)

2. Text book of organic chemistry by Graham solomons, Wiley(2015)
3. Text book of organic chemistry by Sony, Sultan Chand & Sons; 29th edition (2012)
4. Text book of organic chemistry by Bruice yuranis Powla, (2012)
5. General Organic chemistry by Sachin kumar Ghosh, New Age Publishers Pvt Ltd (2008)

Laboratory Course

Paper III (Organic Synthesis)

45 h (3h/week)

1. Synthesis of Organic compounds:

Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.

Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.

Halogenation: Preparation of p-bromo acetanilide, Preparation of 2,4,6-tribromo phenol

Oxidation: Preparation of benzoic acid from benzyl chloride.

Esterification: Preparation of n-butyl acetate from acetic acid.

Methylation: Preparation of - naphthyl methyl ether.

Condensation: Preparation of benzilidene aniline and Benzaldehyde and aniline.

Diazotisation: Azocoupling of β -Naphthol.

2. Microwave assisted synthesis of Asprin – DEMO (demonstration only)

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B.Sc. II yr CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER IV
Paper-IV
Chemistry - IV

15h (1 h/week)

Unit-I (Inorganic Chemistry)

11 h

S4-I-1: Coordination Compounds –II

Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in octahedral, tetrahedral, square planar with suitable examples. Crystalfield stabilization energies and its calculations for various dn configurations in octahedral complexes. High Spin Low Spin complexes. Colour and Magnetic properties of transition metal complexes. Calculations of magnetic moments spin only formula. Detection of complex formation - basic principles of various methods- change in chemical properties, solubility, colour, pH, conductivity, magnetic susceptibility.

Hard and soft acids bases (HSAB) - Classification, Pearson's concept of hardness and softness, application of HSAB principles – Stability of compounds / complexes, predicting the feasibility of reaction. Thermodynamic and kinetic stability of transition of metal complexes. Stability of metal complexes –stepwise and overall stability constant and their relationship and chelate effect determination of composition of complex by Job's method and mole ratio method.

Applications of coordination compounds: Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization – Ziegler Natta catalyst d) water softening.

S4-I-2: Bioinorganic Chemistry

4 h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl⁻). Toxic metal ions As, Hg & Pb Oxygen transport and storage – structure of hemoglobin, binding and transport of oxygen. Fixation of CO₂ in photosynthesis- overview of light and dark reactions in photosynthesis. Structure of chlorophyll and coordination of magnesium. Electron transport in light reactions from water to NADP⁺ (Z – scheme).

Semester-IV

Unit - II (Organic Chemistry)

15h(1 hr/week)

S4-O-1: Carbohydrates

6 h

Introduction: Classification and nomenclature. Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure. Number of optically active, isomers possible for the structure, configuration

of glucose based on D-glyceraldehyde as primary standard (No proof for configuration is required). Evidence for cyclic structure of glucose (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – ketohexose structure. Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure, Haworth formula).

Inter Conversion of Monosaccharides: : Arabinose to D-glucose, D- mannose (kiliani – Fischer method). Epimers, Epimerisation- Lobry de bruyn van Ekenstein rearrangement. D-glucose to D-arabinose by Ruff's degradation. Aldohexose(+) (glucose) to ketohexose (-) (fructose) and Ketohexose(Fructose) to aldohexose (Glucose).

S4-O-2: Amino acids and proteins

5 h

Classification. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples – Glycine, Alanine, Valine and Leucine) by following methods: a) From halogenated Carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids. Zwitter ion structure – salt like character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups – Lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides. Primary structure of proteins, di peptide synthesis

S4-O-3: Heterocyclic Compounds

4 h

Introduction and definition: 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems –Numbering. Aromatic character

Resonance structures: Explanation of feebly acidic character of pyrrole, electrophilic substitution, Halogenation, Nitration and Sulphonation. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene Paul-Knorr synthesis. Structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – preparation by Hantsch method and properties – Reactivity towards Nucleophilic substitution reaction – chichibabin reaction.

Unit III (Physical Chemistry)

15h (1 hr/week)

S4-P-1: Chemical Kinetics

11 h

Introduction to chemical kinetics, rate of reaction, variation of concentration with time, rate laws and rate constant. Specific reaction rate. Factors influencing reaction rates: effect of concentration of reactants, effect of temperature, effect of pressure, effect of reaction medium, effect of radiation, effect of catalyst with simple examples. Order of a reaction. First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Examples- Decomposition of H_2O_2 and decomposition of oxalic acid, Problems. Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, examples-

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Saponification of ester, $2O_3 \rightarrow 3O_2$, $C_2H_4 + H_2 \rightarrow C_2H_6$. Characteristics of second order reaction, units for rate constants, half- life period and second order plots. Problems

S4-P-2: Photochemistry

4 h

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry- Grotthus Draper law, Stark-Einstein's Law of photochemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2-Cl_2 and H_2-Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency. Consequences of light absorption. Singlet and triplet states. Jablonski diagram. Explanation of internal conversion, inter- system crossing, phosphorescence, fluorescence.

Unit III (General Chemistry)

15h (1 hr/week)

S4-G-1: Theories of bonding in metals

4 h

Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors n-type and p-type, extrinsic & intrinsic semiconductors, and insulators.

S4-G-2: Carbanions-II

5 h

Mannich reaction , Michael addition and Knoevenagel condensation Synthetic applications of Aceto acetic ester. Acid hydrolysis and ketonic hydrolysis: Preparation of ketones, monocarboxylic acids and dicarboxylic acids Malonic ester- synthetic applications. Preparation of (i) substituted mono carboxylic acids and (ii) substituted dicarboxylic acids.

S4-G-3: Colloids & Surface Chemistry

6 h

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy-Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids.

Adsorption:Types of adsorption. Factors influencing adsorption. Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

References

General reference: B.Sc II Year Chemistry : Semester IV, Telugu Academy publication, Hyd Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company(1977)
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press(1989).
6. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
7. Textbook of Inorganic Chemistry by R Gopalan, Universities Press,(2012)

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6. Text book of organic chemistry by C N pillai CRC Press (2012)
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Unit III

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3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Physical Chemistry through problems by S.K. Dogra. (2015)
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone. Macmillan (1966)
8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990

Unit IV

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2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Text book of organic chemistry by Morrison and Boyd, Person (2009)
6. Text book of organic chemistry by Graham solomons, Wiley (2015)
7. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, CBA,(2014)
8. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
7. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
8. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
9. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities, Press 2014

Laboratory Course

Paper IV-

Qualitative Analysis of Organic Compounds:

45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

B.Sc. Chemistry II Year
Semester III
Skill Enhancement Course- II (SEC -II) (2 Credits)
REMEDIAL METHODS FOR POLLUTION, DRINKING WATER AND SOIL
FERTILITY STANDARDS

UNIT I: Remedial Methods for Pollution Prevention and control of air pollution **15 h (1 hr/week)**

Ozone hole-causes and harm due to ozone depletion. The effect of CFC's in Ozone depletion and their replacements. Global Warming and Greenhouse Effect Precautions to control global warming. Deleterious effect of pollutants - Endangered Monuments- acid rain. Precautions to protect monuments. Sources of Radiation pollution - Chernobyl accident and its Consequences. Radiation effect by the usage of cell phones and protection tips. Deleterious effects of cell phone towers and health hazards.

Sources of water pollution-(i). Pollution due to pesticides and inorganic chemicals, (ii). Thermal pollution (iii). Ground water pollution (iv). Eutrophication.

Methods for control of water pollution and water recycling. Dumping of plastics in rivers & oceans and their effect on aquatic life. Determination of (i) Dissolved Oxygen and (ii) Chemical Oxygen Demand in polluted water - Illustration through charts (or) demonstration of experiments. Sources of soil pollution (i). Plastic bags, (ii). Industrial and (iii). Agricultural sources. Control of soil pollution. Environmental laws in India. Environmental benefits of planting trees.

UNIT II: Drinking Water and Soil Fertility Standards and Analysis **15 h (1 hr/week)**

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards : Inorganics, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards-Inorganics and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemical oxidation and (iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry- Basic Concepts. Effect of pH on nutrient availability. Macronutrients and their effect on plants -Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus other macronutrients-Calcium, Magnesium and Sulfur. Micronutrients and their effect on plants. Boron ($B_4O_7^{2-}$), Copper (Cu^{2+}), Iron (Fe^{2+} , Fe^{3+}) Manganese (Mn^{2+}) Molybdenum (MoO_4^{2-}) Zinc (Zn^{2+}) Cobalt (Co^{2+}) Chlorine (Cl^-) and Others. Determination of soil nitrogen by Kjeldahl method- Illustration through charts (Or) demonstration of experiment. Visit to nearby agricultural farms and interaction with farmers. Discussion with farmers on the use of Soil Analysis Kits.

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B.Sc. Chemistry II Year
Semester - IV
Skill Enhancement Course- III (SEC - III) (2 Credits)
Materials and their Applications

Unit – I: Types of Materials

15 h (1 hr/week)

Introduction: Materials and their importance. Classification of Materials, Advanced materials and their need. Types of Materials: Metals, ceramics, polymers and composites; Nature of bonding (Type of bond present). Types and applications of metal alloys: Classification- ferrous and non-ferrous alloys. Ferrous alloys -types and their applications. Non-ferrous alloys – Cu, Al, Ti alloys, their applications and super alloys.

Field Work- Collection of Metal Alloy Samples.

Types and Applications of Ceramics: Classification of Ceramics based on their application- glasses, clay products, refractories, abrasives, cements, and advanced ceramics. Glasses: Compositions and Characteristics of Some of the Common Commercial Glasses; Properties and applications of glass ceramics - preparation of charts depicting various types of glass and their use. Clay products: Structural clay products and the white wares. Refractories: Compositions of four Common Ceramic Refractory Materials, fireclay, silica, basic refractories ex. MgO and special refractories ex. Alumina and Zirconia Cements: Classification, preparation of cement and the setting process; quick setting cements; applications.

Field Work-Visit to industries and collection of samples of materials

Unit – II: Types of Polymers and Applications

15 h (1 hr/week)

Classification of Polymeric materials based on application: Coatings, adhesives, films, foams with examples Polymer Additives: Fillers, Plasticizers, Stabilizers, Colorants, Flame Retardants with examples.

Advanced Materials: Types of advanced materials - semiconductors, bio-compatible materials, smart materials, advanced polymeric materials and nano-engineered materials. Biocompatible materials: Definition. Materials used as biomaterials and their properties. Metals and alloys used in bone and joint replacement. Filling and restoration materials – dental cements, dental amalgams, dental adhesives.

Field Work- Visit to Dental Clinics and interaction with Doctors regarding materials used in Dental treatments.

Smart materials: Shape memory alloys- definition and examples (Ni-Ti alloys, Cu based alloys), applications. Conducting polymers: - Introduction, Electrically conducting polymers and their uses (polyaniline, polypyrrole, polyacetylene and polythiophene).

References

1. William D. Callister Materials Science and Engineering An Introduction, John Wiley & Sons, Inc, 2006.
2. Material science by Kakani and Kakani.
3. Sujata V., Bhat., —BiomaterialsI, Narosa Publication House, New Delhi, 2002.
4. M. V. Gandhi and B. S. Thompson, —Smart Materials and StructuresI, Chapman and Hall, London, First Edition, 1992.
5. Duerig, T. W., Melton, K. N, Stockel, D. and Wayman, C.M., —Engineering aspects of Shapememory AlloysI, Butterworth – Heinemann, 1990.
6. Conducting Polymers, Fundamentals and Applications A Practical Approach Authors: Chandrasekhar, Prasanna Ashwin-Ushas Corp., Inc. Kluwer Academic Publishers. Boston

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References

1. A Text book for 'Remedial methods for pollution, drinking water and soil fertility standards', First Edition, Authors: Dr Mudvath Ravi, Gopu Srinivas, Putta Venkat Reddy, Vuradi Ravi Kumar, Battini Ushaiah, ISBN No. 978-93-5311-183-0.
2. Remedial methods for pollution, drinking water and soil fertility standards, Author: Dr G. Vanjatha.
3. Remedial methods for pollution, drinking water and soil fertility standards, Telugu version, Authors: Dr N. Yogi Babu, Dr. G. Vanajatha, M. Srilatha.
4. Environmental Pollution, download.nos.org/333courseE/10.pdf
5. CFC Replacements, butane.chem.uiuc.edu/pshapley/Environmental/L21/3.html
6. Effects of Acid Rain on Buildings www.air-quality.org.uk/12.php
7. Acid Rain Effects - Buildings - Chemistry chemistry.elmhurst.edu/vchembook/196buildings.html
8. How to protect national heritage - ways to protect monuments www.youthkiawaaz.com/2011/03/how-to-protect-national-heritage/.
9. Chernobyl nuclear power plant accident - NRC www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.pdf
10. Side-effects of harmful radiation from mobile phones and towers pib.nic.in/newsite/printrelease.aspx?relid=116304
11. Cell Phone Radiation Protection - Highly Effective Tips <https://www.electricsense.com/775/how-to-protect-yourself-from-cell-phone-radiation/>
12. Chemical Waste That Impact on Aquatic Life or Water Quality blog.idrenvironmental.com/chemical-waste-that-impact-on-aquatic-life-or-waterquality
13. Trees and Your Environment - Clean Air Gardening www.cleanairegardening.com/plantingtrees
14. water quality and common treatments for private drinking water . extension.uga.edu/publications/detail.html?number=b939
15. Soil chemistry <https://casfs.ucsc.edu/about/publications/Teaching-Organic-Farming/PDFdownloads/2.2-soil-chemistry.pdf>
16. Soil Analysis-Determination of Available Nitrogen ... - Amrita Virtual Lab lab.amrita.edu/?sub=2&brch=294&sim=1551&cnt=1
17. Determination of dissolved oxygen (DO) www.cutm.ac.in/pdf/env%20engg%20lab%20manual.pdf
18. Determination of chemical oxygen demand of wastewater www.pharmaguideline.com/quality-control/test

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P. L

B.Sc. CBCS CHEMISTRY
Theory Model Question Paper
For
Semester I, II, III, IV

Time : 3 Hrs.

Max.Marks : 80

Note: Answer eight questions from Part-A and all questions from Part-B. Each question carries 4 marks in Part-A and 12 marks in Part-B.

Part-A

(8 x 4 = 32 Marks)

(Short Answer Type)

I. Write any **Eight** questions of the following

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

Part-B

(4 x 12 = 48 Marks)

(Essay Answer Type)

II. Answer all Questions

1 a)

(OR)

b)

2 a)

(OR)

b)

3 a)

(OR)

b)

4 a)

(OR)

b)

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B.Sc. Chemistry II Year Semester IV
Skill Enhancement Course- IV (SEC - IV) (2 Credits)
Chemistry of Cosmetics and Food Processing

Unit-I: Chemistry of Cosmetics and Perfumes

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol. Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition, analysis of calcium in milk by complexometric titration, spectrophotometric analysis of iron in foods, Spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks. Field Work -Visit to Food Industries. Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce. Field Work-Collection of adulterated food samples, demonstration of a minimum of five experiments for testing adulterants in food items.

References

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci., AugSep 2015; 2(4A):304-311.
5. W.A. Poucher, Perfumes, Cosmetics and Soaps (1993).
6. Srilakshmi, Food Science. Edition: 3rd (2004).
7. Lillian Hoagland Meyer, Food chemistry (2008).
8. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, S. Ranganna, Tata McGraw-Hill Education, 1986 – Food.
9. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
10. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.

Vijay

2
5/1/21

P. S. Rao

B. S. Rao



Nizam College

Recognized by N.Y.C. with B
A Constituent College of Osmania University



Department of Chemistry

B.Sc. Chemistry, III Year, CBCS Syllabus

**PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.Sc., Chemistry (for the batch admitted in 2021-22)**

| CBCS COURSE STRUCTURE, NIZAM COLLEGE, OU, HYDERABAD, TELANGANA STATE | | | | | | | |
|--|-------------|--|--|-----------|-----------|--|------------------------------|
| | CODE | COURSE TITLE | | HPW | CREDITS | EXAM HOURS | MARKS |
| SEMESTER-V | | | | | | | |
| 1 | ELS-5 | English (First Language) | | 3 | 3 | 2hrs | 80C+15-I+5A |
| 2 | SLS-5 | Second Language | | 3 | 3 | 2hrs | 80C+15-I+5A |
| 3 | GE | Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals | | 4 | 4 | 3 hrs | 80C+15-I+5A |
| 4 | DSE -501 | A | | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | | | | | |
| | | C | | | | | |
| 5 | DSE -502 | A | | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | | | | | |
| | | C | | | | | |
| 6 | DSE -503 | A | Spectroscopy and Chromatography (or) | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | Metallurgy, Dyes and Catalysis | | | | |
| | | | Laboratory Course-V Experiments in Physical Chemistry-I | | | | |
| Total | | | | 31 | 25 | | 600+150P |
| SEMESTER-VI | | | | | | | |
| 7 | ELS-6 | English (First Language) | | 3 | 3 | 2hrs | 80C+15-I+5A |
| 8 | SLS-6 | Second Language | | 3 | 3 | 2hrs | 80C+15-I+5A |
| 9 | PR | Project in Chemistry / Advanced Chemistry | | 4 | 4 | 1 ¹ / ₂ hr / 3hrs | 75C+25-I (or) 80C+15-I+5A |
| 10 | DSE -601 | A | | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | | | | | |
| | | C | | | | | |
| 11 | DSE -602 | A | | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | | | | | |
| | | C | | | | | |
| 12 | DSE -603 | A | Medicinal Chemistry (or) | 4+3(7) | 5 | 3 hrs | 80C+15-I+5A(50P) |
| | | B | Agricultural and Fuel Chemistry | | | | |
| | | | Laboratory Course-VI Experiments in Physical Chemistry-II | | | | |
| Total | | | | 31 | 25 | | 600+150P |

U/fay

Syllabus Approved
6/8/21

CHAIRMAN
Board of Studies in Chemis-y
Dept. of CHEMISTRY
Osmania University, Hyd-07.

P. Deelavathi
6/8/21
(Prof. P. Deelavathi)

HEAD
(Dr. B. Sreeram)

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-07

HEAD
Dept. of Chemistry
Nizam College
Hyderabad-1.

Semester V
Generic Elective (GE) Course - I (4 Credits)
(for B.Sc. Non Chemistry/B.A/B.Com Students)
Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals **60Hrs**

Unit-I: Chemistry of Cosmetics and Perfumes **15 Hrs**

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol.

Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Chemistry and Applications of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration **15 Hrs**

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition,

Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce.

Food Packaging: Definition and function of packaging-Classification of packaging materials-different types of packaging materials such as glass, wood, metal, paper, wood, plastic etc., - advantages and disadvantages of each packaging material. Packaging materials and systems: corrugated fibre board boxes, shrink bundles and reusable packages. Effect of packaging materials on nutritive values of food.

Food labelling: Introduction, need and importance.

Unit – III: General Characteristics of Drugs **15Hrs**

Introduction: Diseases – causes of diseases, Drug – definition and sources.


ADME of drugs (brief) – Absorption, distribution, drug metabolism (in liver), elimination (brief). Toxicity.



Examples (i) Zintac (Ranitidine, antacid) (ii) Paracetamol (antipyretic) (iii) Benadryl (Cough syrup). Characteristics of an ideal drug.


Nomenclature of Drugs: chemical name – generic name – trade name. Trade names for the given generic names – (i) Aspirin (ii) Amoxicillin (iii) Ciprofloxacin (iv) Paracetamol (v) Mebendazole

Drug formulations: Definition – need for conversion of drug into pharmaceutical (drug formulations) – Additives – diluents, binders, lubricants, antioxidants, flavourants, sweeteners, colourants, coating agents. Classification of Drug formulations: oral, parenterals and topical dosage forms – advantages and disadvantages.

(i) **Oral Dosage forms:** Tablets (Aspirin – analgesic; Ciprofloxacin - antibacterial). Capsules (Amoxicillin – antibiotic; Omeprazole-antacid). Syrups (B-complex syrup; Benadryl- Cough syrup).


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UCS, Osmania University
Hyderabad-007

- (ii) Parenterals (Injection forms): Propranolol (antihypertensive), Heparin (anticoagulant)
 (iii) Topical dosage forms: Creams and Ointments
 (iv) Antiallergic: Aclometasone (Aclovate), Betamethasone valerate(2%) Multiple purposes,
 (v) Anti-itching: Doxepin Zonalon), Antifungal: Miconazole (Dactarin, Neomicol),
 Ketoconazole, (Nizoral Cream), Fluconazole, Anesthetic- Lidocaine, (Lidocaine ointment) and
 Antiseptic: Boro Plus Cream, For burns -Iodine ointment

1511rs

Unit – IV: Classification of Drugs

Classification of drugs based on therapeutic action-Chemotherapeutic agents, Pharmacodynamic agents and drugs acting on metabolic processes.

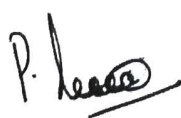
Brief explanation for the following:

- (i) **Chemotherapeutic agents:** Antimalarials – Chloroquine; Antibiotic – Amoxicillin; Antitubercular drugs – isoniazide; Antiprotozoals – metronidazole.
- (ii) **Pharmacodynamic agents**
- (a) Drugs acting on CNS: Diazepam (CNS depressant), General anesthetic (thiopental sodium), antipyretic and analgesic (Ibuprofen)
- (b) Drugs acting on PNS: local anaesthetics (Benzocaine)
- (c) Drugs acting on cardiovascular system: Metoprolol (antihypertensive agents), Nefidipine (antianginal and antihypertensive agent)
- (d) Drugs acting on renal system: Diuretics (Acetazolamide)
- (iii) **Drugs acting on metabolic processes**
- (a) Vitamins: Common name, source, deficiency, vitamin A, B2, B6, C, D, E and K – remedy
- (b) Hormones: Function (brief) - deficiency of hormones (Insulin, Testosterone and Oestrogen)

Recommended Text Books and Reference Books

1. Industrial Chemistry, Vol -I, E. Stocchi, Ellis Horwood Ltd. UK.
2. Engineering Chemistry, P.C. Jain, M. Jain, Dhanpat Rai & Sons, Delhi.
3. Industrial Chemistry, Sharma, B.K. & Gaur, H. , Goel Publishing House, Meerut (1996).
4. Food Processing and Impact on Nutrition, Rameen Devi, Sc J Agric Vet Sci., Aug-Sep 2015; 2(4A):304-311.
5. Perfumes, Cosmetics and Soaps , W.A. Poucher, (1993).
6. A first course in food analysis by A Y Sathe
7. Food Science by N.Potter, CBS publishers
8. Food chemistry, Lillian Hoagland Meyer, (2008).
9. A Handbook of food packaging by F. A. Paine and H.Y. Paine.
10. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
11. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.
12. Drugs by G.L.David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K.L.N.Reddy, C.Sudhakar , Universities Press (India) Limited 2007.
13. An Introduction to Medicinal Chemistry by Graham L. Patrick, Oxford University Press, New York. 1995











B.Sc. Chemistry III Year
Semester-V, Paper-V
Discipline Specific Elective- A (4 Credits)
Spectroscopy and Chromatography

60Hrs

15Hrs

Unit I: Molecular spectroscopy

S5-E-A-I: Introduction to electromagnetic radiation, interaction of electromagnetic radiations with molecules, various types of molecular spectra.

Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules (No derivation), Determination of bond length of rigid diatomic molecules eg. HCl.

Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant (Problems). Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

Electronic spectroscopy

Bonding and antibonding molecular orbitals, electronic energy levels of molecules (σ , π , n), types of electronic transitions: σ - σ^* , n - σ^* , n - π^* , π - π^* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Absorption of characteristics of chromophores: diene, enone and aromatic chromophores. Representation of UV-visible spectra. General features of absorption – spectroscopy, transmittance, absorbance, and molar absorptivity. Beer Lambert's law and its limitations.

Unit II: NMR and Mass Spectrometry

15Hrs

S5-E-A-II: Proton Magnetic Resonance Spectroscopy

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, factors affecting chemical shifts, NMR splitting of signals – spin-spin coupling, representation of proton NMR spectrum – Integrations. ^1H NMR spectrum of – ethyl bromide, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate and acetophenone.

Mass Spectrometry

Electron Impact Mass: Basic principles, Nitrogen rule, types of ions: Molecular ion and fragment ions. Representation of mass spectrum, types of peaks (molecular ion peak, base peak and isotopic ion peaks). Determination of molecular formula. Mass spectrum of ethyl chloride, ethyl bromide and acetophenone.

Unit III: Separation techniques - I

15Hrs

S5-E-A-III: Solvent Extraction- Principle, Methods of extraction: Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron(III).

Chromatography: Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

Thin layer Chromatography (TLC): Advantages, preparation of plates, Solid phase and mobile phase used in TLC, eluotropic series, development of the chromatogram, Detection of the spots, visualizing agents, factors effecting Rf values and applications of TLC.

Handwritten signatures and initials in green ink:
Vijay
P. Desai
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Paper Chromatography: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two dimensional chromatography, detection of spots, and applications of paper chromatography.

15Hrs

Unit IV: Separation techniques - II

S5-E-A-IV: Column Chromatography- Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase solvents for eluting polar, non-polar compounds and its applications.

Ion exchange chromatography: Principle, cation and anion exchange resins, its application in separation of ions, de-ionized water.

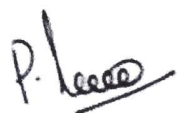
Gas Chromatography: Principle, theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase), applications of GC.

High performance liquid chromatography: Principle, theory and instrumentation, stationary phases and mobile phases. Applications of HPLC, Analysis of paracetamol.

Recommended Text Books and Reference Books

1. Fundamentals of Molecular Spectroscopy, Banwell & McCash
2. Organic spectroscopy, William Kemp, Palgrave Macmillan; 2nd Revised edition
3. Spectroscopy, B K Sharma Krishna Prakashan Media, 1981
4. Elements of Organic Spectroscopy, Y R Sharma.
5. Applications of Absorption Spectroscopy of Organic Compounds (English, Paperback, Dyer R. John)
6. Organic Chemistry, Morrison and Boyd, Pearson Publications.
7. Introduction to Spectroscopy by Donald Pavia, Gary Lampman and George Kriz. Saunders College Division, 2001
8. Chemistry text book for B.Sc., published by Telugu Academy, Govt. of Telangana.
9. Analytical Chemistry by David Krupadanam, Universities Press (India) Limited.
10. Principles of Instrumental Analysis, D.A. Skoog, F.J. Holler, T.A. Nieman, Engage earning India Ed.
11. Fundamentals of Analytical Chemistry 6 th Ed., D. A. Skoog, D.M. West, F.J. Holler, Saunders College Publishing, Fort worth (1992).
12. Instrumental Methods of Analysis 7th Ed Willard, H.H., Merritt, L.L., Dean, J. & Settle, F.A. Wordsworth Publishing Co. Ltd, Belmont, California, USA, 1988.
13. A Textbook of Quantitative Inorganic Analysis 7th Ed, Vogel, A. I. Prentice Hall.
14. Analytical Chemistry 7 th edition by Gary D. Christian (2004).
15. Separation Methods, M.N Sastry, Himalaya Publication (2004).











B.Sc. Chemistry III Year
Semester-V, Paper- V
Discipline Specific Elective-B (4 Credits)
Metallurgy, Dyes and Catalysis

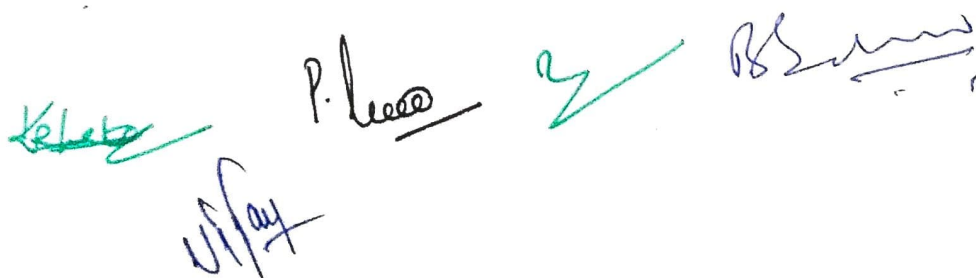
60 Hrs

Unit I: General Principles of Metallurgy and Production of Non Ferrous Metals 15 Hrs
S5-E-B-I: Pyrometallurgy: Drying and calcination, roasting, smelting, products of smelting.
Hydrometallurgy: Leaching methods, leaching agents, leaching of metals, oxides and sulphides.
Separation of liquid and solid phases and processing of aqueous solutions
Electrometallurgy: Electrolysis, Refining electrolysis, electrolysis from aqueous solutions, fused-salt electrolysis
Refining processes: Chemical and physical refining processes
Production of selected non-ferrous metals (Copper, Nickel, Zinc): Properties, raw materials, production (flow charts presentations and chemical reactions involved) and uses.

Unit II: Natural and Synthetic Dyes 15Hrs
S5-E-B-II: Dyes: Definition, Classification of dyes- Natural dyes, synthetic dyes; based on chemical constitution of dyes; Chemical nature of dyes; Applications of dyes.
Structures of natural dyes: Indigo, Tyrian purple, Alizarin, Indigotin.
Structures of Synthetic Dyes: Nitro dyes, Nitrosodies, Azodies (Mono azodies, bisazodies), diaryl methane dyes, triaryl methane dyes, Xanthene dyes, Phenolphthalein, Fluorocein, Acridine dyes.
Synthesis of dyes: Mono azodies, bisazodies (Congo red), Auromine O, Malachite Green, Crystal Violet, Rhodamine B, Acridine Yellow, Indigotin .
Binding of dyes to fabric. Applications of dyes.

Unit III: Catalysis I 15Hrs
S5-E-B-III: Homogeneous and heterogeneous catalysis -
Definition of a catalyst and catalysis. Comparison of homogeneous and heterogeneous catalysis with specific examples. General characteristics of catalytic reactions.
Acid-base catalysis- Examples of acid and base catalysed reactions, hydrolysis of esters.
Kinetics of acid catalysed reactions. Specific acid and general acid catalysis, Kinetics of base catalysed reactions. Specific base and general base catalysis. Examples-Aldol condensation and decomposition of nitramide, base catalysed conversion of acetone to di acetone alcohol. Mutarotation of glucose. Effect of pH on reaction rate of acid and base catalysed reactions.
Phase transfer catalysis: Principle of phase transfer catalysis, classification of phase transfer catalysts. Factors influencing the rate of PTC reactions.



Unit IV: Catalysis II 15Hrs
S5-E-B-IV: Enzyme catalysis- Characteristics of enzyme catalysis, Examples: (i) Invertase in inversion of cane sugar (ii) Maltase in conversion of maltose to glucose (iii) Urease in decomposition of urea (iv) Zymase in conversion of glucose to ethanol (v) working of carbonic anhydrase and (vi) Mechanism of oxidation of ethanol by alcohol dehydrogenase Factors affecting enzyme catalysis. Effect of temperature, pH, concentration and effect of inhibitor on enzyme catalysed reactions, Catalytic efficiency.




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Kinetics of enzyme catalysed reactions: Michaelis-Menton Equation. Mechanism of enzyme catalysed reactions. Significance of Michaelis constant (K_m) and maximum velocity (V_{max}), Lineweaver-Burk plot. Types of enzyme inhibitors

Recommended Text Books and Reference Books

1. Industrial Chemistry, B K Sharma
2. Engineering Chemistry, Jain and Jain
3. Industrial Chemistry E. Stocchi, Vol-I, Ellis Horwood Ltd. UK.
4. Handbook of Industrial Chemistry, J. A. Kent: Riegel's, CBS Publishers, New Delhi.
5. Theory of production of non-ferrous metals and alloys Study. Kateřina Skotnicová, Monika Losertová, Miroslav Kursa
6. The Chemistry of Synthetic Dyes, Volume 4, K Venkataraman Elsevier
7. Organic Chemistry Vol-I by I.L. Finar.
8. Organic Chemistry by Jennice, Gorzinski Smith
9. Natural Dyes: Sources, Chemistry, Application and Sustainability Issues by Sujata Saxena and A. S. M. Raja.
10. Physical Chemistry by Atkins and De Paula, 8 th Edn.
11. Physical Chemistry by Puri, Sharma and Pattania, 2017.
12. Kinetics and mechanism of chemical transformations by Rajarajm and Kuraiacose, Published by Macmillan India Ltd.
13. Text book of Physical Chemistry, K.L. Kapoor, Macmillan, 1999.
14. Catalysis, J.C. Kuriacose, Macmillan Macmillan Publishers India Limited, 1980.
15. Phase Transfer Catalysis, Fundamentals, Applications and Industrial perspective, C. M. Stark, C. Liotta & M. Halpern, Academic Press
16. Phase Transfer Catalysis, E. V. Dehmlow & S. S. Dehmlow, Verlag Chemie, Weinheim

Semester - V
Laboratory Course
Paper V Experiments in Physical Chemistry-I

45 h (3 h / w)

1. Distribution law

- a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
- b) Determination of distribution coefficient of acetic acid between n-butanol and water.

2. Electrochemistry

- a) Determination of cell constant of a conductivity cell.
- b) Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.

3. Colorimetry

- a) Verification of Beer's law using $KMnO_4$
- b) Determination of the concentration of the given $KMnO_4$ solution.

4. Adsorption

- b) Adsorption of acetic acid on animal charcoal - Verification of Freundlich adsorption isotherm.

5. Physical constants

- a) Surface tension and b) viscosity of liquids. (Demonstration Experiment)

Reference books:

1. Senior practical physical chemistry. B. D. Khosla, V.C. Garg, Adarsh Gulati Published by R. Chand & Co.
2. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan. Viva Books
3. Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5 / 1403929165
ISBN-13: 978-1-4039-2916-7 / 9781403929167


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B.Sc. Chemistry III Year
Semester -VI
Optional for Chemistry Stream
Advanced Chemistry

60Hrs

Unit-I (Inorganic Chemistry)

15 Hrs

4h

S6-O-I-1: Inorganic reaction mechanisms

Labile and inert complexes, Thermodynamic and kinetic stability based on VBT & CFT: ligand substitution reactions $-S_N1$ and S_N2 in Octahedral complexes; substitution reactions of square planar complexes – Trans effect and applications of trans effect. Reactions of tetrahedral complexes - Hydrolysis of silicon halides and phosphorous oxides.

2 h

S6-O-I-2: Boranes and Carboranes

Definition of clusters. Structures of boranes and carboranes- Wade's rules. closo, nido, arachno boranes and carboranes

5 h

S6-O-I-3: Symmetry of molecules

Symmetry operations and symmetry elements in molecules. definition of axis of symmetry types of c_n , plane of symmetry (σ_h , σ_v , σ_d), center of symmetry and improper rotational axis of symmetry (S_n). Explanation with examples.

4 h

S6-O-I-4: Non – aqueous solvents

Classification and characteristics of a solvent. Reactions in liquid ammonia – physical properties, auto-ionisation, examples of ammonium acids and ammonium bases. Reactions in liquid ammonia – precipitation, neutralization, solvolysis, solvation - solutions of metals in ammonia, complex formation, redox reactions. Reactions in HF – autoionisation, reactions in HF – precipitation, acid – base reactions, protonation.

15 Hrs

Unit-II (Organic Chemistry)

5 h

S6-O-O-1: Pericyclic Reactions

Concerted reactions, Molecular orbitals of ethene, 1,3-butadiene and allyl radical. Symmetry properties, HOMO, LUMO, thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each and their explanation by FMO theory.

5 h

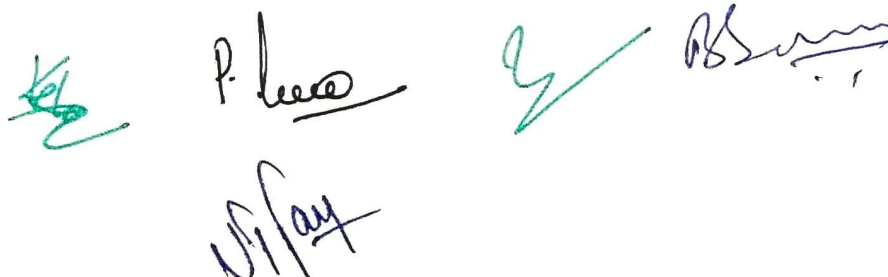
S6-O-O-2: Synthetic Strategies

Terminology – Target molecule (TM), Disconnection approach – Retrosynthesis, Synthons, Synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent synthesis. Retrosynthetic analysis of the following molecules: 1) acetophenone 2) cyclohexene and 3) 2-phenylethanol.

5 h

S6-O-O-3: Asymmetric synthesis

Definition and classification of stereoselective reactions: substrate, product stereoselective reactions, enantio and diastereo selective reactions. Stereospecific reaction – definition –example – dehalogenation of 1,2-dibromides induced by iodide ion. Enantioselective reactions – definition – example –Reduction of Ethylacetoacetate by Yeast. Diastereoselective reaction- definition-


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example: Acid catalysed dehydration of 1-phenylpropanal and Grignard addition to 2-phenylpropanal. Definition and explanation of enantiomeric excess and diastereomeric excess.

Unit III (Physical Chemistry)

15 Hrs

S6-O-P--1: Polymers

Definition of polymers – natural polymers and synthetic polymers examples classification as plastics, fibers, elastomers.

Thermosetting, thermoplastic polymers. Branched, cross-linked and co-polymers.

Definition of polymerization-addition and condensation polymerization with examples.

Explanation: chain polymerization, step polymerization, co-polymerization and co-ordination polymerization. Kinetics of free radical polymerization. Tacticity, atacticity, stereo specific synthesis- Zeigler- Natta catalyst.

Molecular weight definitions- number average, weight average molecular weight. Determination of molecular weight of polymers using viscosity method, Osmometric method. Problems.

Preparation and industrial applications of polyethylene, poly vinyl chloride (PVC), nylon –66, teflon, polyacrylonitrile and terelene.

Introduction to biodegradability and examples of biodegradable polymers.

Unit IV: (General Chemistry)

15 Hrs

S6-O-G--1:: Electroanalytical methods

Types of Electroanalytical Methods.

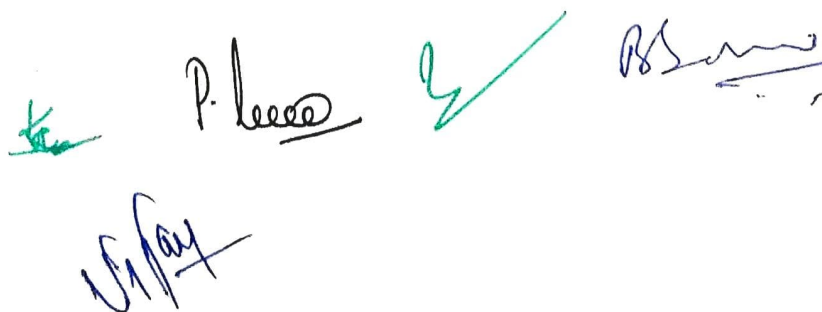
I) Interfacial methods – a) Potentiometry: Principle, Electrochemical cell, Electrodes- (i) Indicator and (ii) Reference electrodes – Normal Hydrogen Electrode, Quinhydrone Electrode, Saturated Calomel Electrode. Numerical Problems. Application of Potentiometry – Assay of Sulphanilamide

b) Voltametry – three electrode assembly; Introduction to types of voltametric techniques, micro electrodes, Over potential and Polarization.



II) Bulk methods – Conductometry, Conductivity Cell, Specific Conductivity, Equivalent Conductivity. Numerical Problems. Applications of conductometry. Estimation of Cl – using AgNO₃. Determination of Aspirin with KOH.

Recommended Text Books and Reference books

1. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3 rd edn Wiley Publishers (2001).
2. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4 th edn. (2006)
3. Inorganic Chemistry by Shriver and Atkins 3 rd edn Oxford Press (1999).
4. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
5. Symmetry and Spectroscopy of Molecules, K. Veera Reddy, Second Edition, New Age International (P) Limited Publishers
6. Textbook of Inorganic Chemistry by R Gopalan, Universities Press,(2012)
7. Text book of organic chemistry by Morrison and Boyd, Pearson Publishers (2009)
8. Text book of organic chemistry by Graham Solomons, Wiley(2015)


A collection of handwritten signatures and initials in green and blue ink, including a signature that appears to be 'P. Veera Reddy' and another that looks like 'Vijay'.

- (First) - Semester
9. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, NCBA,(2014)
 10. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
 11. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
 12. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
 13. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities Press(2014)
 14. Polymer Chemistry, M G Arora and M Singh
 15. Introductory Polymer Chemistry by G S Misra
 16. Textbook of Polymer Science, F. W. Billmeyer Jr, John Wiley & sons
 17. Polymer Science, V. R. Gowarikar, N. V. Viswanathan & J. Sreedhar, Wiley Eastern
 18. Contemporary Polymer Chemistry, H. R. Alcock & F. W. Lambe, Prentice Hall
 19. Materials Science and Engineering An Introduction by William D. Callister, Jr. John Wiley & Sons, Inc
 20. Principles of Instrumental Analysis, D.A. Skoog, F.J. Holler, T.A. Nieman, Engage earning India Ed
 21. Fundamentals of Analytical Chemistry 6 th Ed., D. A. Skoog, D.M. West, F.J. Holler, Saunders College Publishing, Fort worth (1992)
 22. Physical Chemistry by Atkins and De Paula, 8 th Edn.
 23. Physical Chemistry by Puri, Sharma and Patania, 2017


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B.Sc. Chemistry III Year
Semester-VI, Paper-VI
Discipline Specific Elective-A (4 Credits)
Medicinal Chemistry

60Hrs

15Hrs

Unit- I: Introduction and Terminology

S6-E-A-I: Diseases: Common diseases, infective diseases—insect borne, air-borne, water-borne and hereditary diseases.

Terminology in Medicinal Chemistry: Drug, Active Pharmaceutical Ingredient (API), Pharmaceuticals, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, anti metabolites and therapeutic index.

Drugs: Nomenclature: Chemical name, Generic name and Trade names with examples; Classification: Classification based on structures and therapeutic activity with examples.

ADMET: a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions. d) Elimination: definition and renal elimination. Toxicity.

15Hrs

Unit-II: Enzymes and Receptors

S6-E-A-II: Enzymes: Introduction. Mechanism and factors affecting enzyme action, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance. Types of inhibition - reversible, irreversible and their subtypes with examples.

Receptors: Introduction, Drug action-receptor theory, Mechanism of drug action, concept of agonists and antagonists with examples. Drug receptor interactions involved in drug receptor complex. binding role of -OH group, -NH₂ group, quaternary ammonium salts and double bond. Structure – activity relationships of drug molecules, explanation with sulfonamides.

Unit- III: Synthesis and Therapeutic Activity of Drugs

15Hrs

S6-E-A-III: Introduction, synthesis and therapeutic activity of

Chemotherapeutics: Sulphanilamide, dapsone, Pencillin-G (semi synthesis), Chloroquin, Isoniazid, Cisplatin and AZT.

Drugs to treat metabolic disorders: Anti diabetic - Tolbutamide; Antiinflammatory – Ibuprofen; Cardiovascular- Glyceryl trinitrate; Antipyretic (paracetamol, aspirin) and Antacid- Omeprazole.

Drugs acting on nervous system: Anesthetics-definition, Classification-local and general. Volatile- Nitrous oxide, chloroform uses and disadvantages. Local anaesthetics – benzocaine.

Unit- IV: Molecular Messengers, Vitamins and Micronutrients

15Hrs

S6-E-A-IV: Molecular Messengers: Introduction to hormones and neurotransmitters, Thyroid hormones, Antithyroid drug-Carbimazol. Adrenaline: Adrenergic drugs- salbutamol, atenolol. Serotonin: SSRIs- fluoxetine. Dopamine: Antiparkinson drug- Levodopa .

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Vitamins and Micronutrients: Introduction, vitamin sources, Deficiency disorders and remedy of Vitamins A, B, C, D, E, K and micronutrients – Na, K, Ca, Cu, Zn and I.

Recommended Text Books and Reference books

1. Introduction to Medicinal Chemistry, G.L. Patrick, Oxford University Press, New York. 2013.
2. Medicinal Chemistry, Thomas Nogrady, Oxford Univ. Press, New York. 2005.
3. Foye's Principles of Medicinal Chemistry, David William and Thomas Lemke, Lippincott Williams & Wilkins, 2008.
4. Medicinal Chemistry, Ashutosh Kar, New Age International, 2005.
5. Synthetic Drugs, O.D. Tyagi & M. Yadav, Anmol Publications, 1998.
6. Medicinal Chemistry, Alka L. Gupta, Pragati Prakashan.
7. Drugs, G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Universities Press (India) Ltd. 2012.

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B.Sc. Chemistry III Year
Semester –VI, Paper-VI
Discipline Specific Elective-B (4 Credits)
Agricultural and Fuel Chemistry

60 Hrs

Unit I: – Pesticides

15Hrs

S6-E-B-I: Introduction, Definition, classification of pesticides based on use (target). Toxicity and chemical structure with examples. Adverse effects of pesticides and its impact on environmental pollution.

Synthesis, manufacture and uses of representative pesticides: Organochlorines (Cypermethrin); Organophosphates (Parathion); Carbamates (Carbaryl); Quinones (Chloranil), Anilides (Alachlor).
Pesticide formulations: Dusts, Granules, Wettable powders, Emulsions and Aerosols.

Biopesticides : Introduction: Potential pesticidal plants of India, Role of Neem in plant protection-constituents, Azadirachtin and its role in pest control, Structure and mode of action of Pyrethrins (pyrethrin-1) and Pyrethroids (permethrin) and nicotinoids (Imidacloprid).

Unit II: – Fertilizers

15Hrs

S6-E-B-II: Introduction: (need of fertilizers), functions of essential plant nutrients (N, P, K), Classification formula and uses of fertilizers:

Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride and their uses.

Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate and their uses.

Potassium fertilizers: Potassium chloride, potassium nitrate, potassium sulphate and uses. Complex fertilizers: Diammonium Phosphate and mixed fertilizers their uses. Manufacture of urea and Super phosphate of lime and their reactions in the soil.

Biofertilizers – Introduction, definition, classification, Rhizobium, Azatobactor, Azospirillum, Azolla, Blue Green Algae, Vermicomposting and uses.

Organic farming: The principal methods, crop rotation, green manures and compost, biological pest control, and mechanical cultivation and uses.

Unit III: Energy Sources and Coal

15Hrs.

S6-E-B-III: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar based chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.


Unit IV: Petroleum and its products, petrochemicals and non petroleum fuels

15Hrs.

S6-E-B-IV:

Petroleum and its products

Petroleum: Origin, Composition of crude petroleum and classification. Properties- flash point and its determination, Knocking and antiknocking compounds; Octane number. and Cetane number. Distillation of crude petroleum, Fractional Distillation - Principle and process, refining, Fractions and uses. Cracking -Thermal and catalytic cracking, Reforming


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Petroleum products – Petrol, Diesel, LPG, Kerosene, Tar and their applications.

Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene and their uses.

Lubricants: Classification of lubricants- Solid, semisolid and liquids; Properties (viscosity, flash point, fire point, cloud point, pour point) and their determination. Functions of lubricants. Mechanism of lubrication.

Non-petroleum fuels: Natural Gas-CNG, LNG, Clean Fuels-H₂ gas, ethanol, Fuel from waste - bio-gas, Fuel from biomass –bio-ethanol, biodiesel, Synthetic fuels- syngas based.

Recommended Text Books and Reference books

1. Chemistry of pesticides, N. N. Melnikov, Springer-Verlag- Technology & Engineering (2012).
2. Pesticide Synthesis Handbook, Thomas A. Unger, Elsevier, (2000).
3. Pesticides, R. Cremlyn, John Wiley, 1980.
4. Manures and Fertilisers, K. Kolay, Published by Atlantic (2007).
5. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
6. A Text Book of Engineering Chemistry Paperback – 2017 by Shashi Chawla
7. Industrial Chemistry, Vol-I, Stocchi, E, Ellis Horwood Ltd. UK (1990).
8. Jain, P.C. and Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.
9. Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Sons, Delhi.








Semester - VI
Laboratory course
Paper VI Experiments in Physical Chemistry-II

45h (3 h/w)

1. Kinetics

- a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
- b) Determination of rate of decomposition of hydrogen peroxide catalyzed by FeCl_3 .

2. Electrochemistry

A. Potentiometry:

- a) Determination of redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
- b) Precipitation titration of KCl vs. AgNO_3 -Determination of given concentration of silver nitrate.

B. pH metry:

- a) pH metric titration of strong acid (HCl) vs. strong base- Determination of the concentration of the given acid.
- b) pH metric titration of weak acid(acetic acid) with strong base(NaOH).- Determination of acid dissociation constant (K_a) of weak acid.

3. Conductometry:

- a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurements.

Reference books:

1. Senior practical physical chemistry. B. D. Khosla, V.C. Garg, Adarsh Gulati
2. Advanced Practical Physical chemistry: J.B. Yadav
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu

