DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/B.Sc./CBC & GS/17/2024

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted the following Syllabi under the Faculty of Science & Technology as per Choice Based Credit Grading System** as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Chemistry (Optional)	Vth & VIth semester
2.	B.Sc. Analytical Chemistry (Optional)	Vth & VIth semester
3.	B.Sc. Polymer Chemistry (Optional)	Vth & VIth semester
4.	B.Sc.Biochemistry (Optional)	Vth & VIth semester
5.	B.Sc.Dairy Science & Technology (Optional)	Vth & VIth semester
6.	B.Sc.Microbiology (Optional)	Vth & VIth semester
7.	B.Sc. Botany (Optional)	Vth & VIth semester
8.	B.Sc. Computer Science (Optional)	Vth & VIth semester
9.	B.Sc. Computer Science (Degree)	Vth & VIth semester
10.	B.Sc.Information Technology (Optional)	Vth & VIth semester
11.	B.Sc.Information Technology (Degree)	Vth & VIth semester
12.	Bachelor of Computer Application (Optional)	Vth & VIth semester
13.	Bachelor of Computer Application (Degree)	Vth & VIth semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar.
-431 004.
REF.NO.SU/2024/ 17 86-94
Date:- 21.06.2024.

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Deputy Registrar,
Academic Section

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Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

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Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhaji Nagar

CBCGS Pattern

B.Sc. Chemistry (**Optional**)

Semester V & VI

With effect from 2024-25

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Chairman
Board of Studies in Chemistry,
Dr. Babasaheb Ambedkar Marathwada

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For Faculty of Science and Technology

Course Structure and Scheme of Examination

BSc. Three year Undergraduate Degree Program

Subject : **Chemistry**

Semester I								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1C) Core Courses	CHE 111	Core Course (Theory Paper I) **Inorganic Chemistry**	2	2	50	10	40	20
	CHE 112	Core Course (Theory Paper II) **Organic Chemistry**	2	2	50	10	40	20
	CHE 121	Lab Course 1 (CHE-111 -CHE-112)	3	1.5	50	10	40	20
Total Credits for Semester I: 5.5 (Theory:04 ; Laboratory: 1.5)								

Semester II								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1D) Core Courses	CHE 211	Core Course (Theory Paper III) **Physical Chemistry**	2	2	50	10	40	20
	CHE 212	Core Course (Theory Paper IV) **Applied Chemistry**	2	2	50	10	40	20
	CHE 221	Lab Course 2 (CHE-211 CHE-212)	3	1.5	50	10	40	20
Total Credits for Semester IV: 5.5 (Theory:04; Laboratory: 1.5)								

Practicals exam of both I and II semester will be conducted at the end of second term

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Chemistry

Semester III								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1C) Core Courses	CHE 311	Core Course (Theory Paper V) **Organic Chemistry**	2	2	50	10	40	20
	CHE 312	Core Course (Theory Paper VI) **Physical Chemistry**	2	2	50	10	40	20
	CHE 321	Lab Course 3 (CHE-311)	3	1.5	50	10	40	20
	CHE 322	Lab Course 4 (CHE-312)	3	1.5	50	10	40	20
SEC	CHE 313 Select any one from SEC-1A & SEC-1B	CHE 313 SEC-1A **Laboratory safety and Laboratory Practices**	2	2	50	10	40	20
		CHE 313 SEC-1B **Water Analysis**	2	2	50	10	40	20
Total Credits for Semester III: 07+02 (Theory:04+02; Laboratory: 03)								

Semester IV								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1D) Core Courses	CHE 411	Core Course (Theory Paper VII) **Inorganic Chemistry**	2	2	50	10	40	20
	CHE 412	Core Course (Theory Paper VIII) **Applied Chemistry**	2	2	50	10	40	20
	CHE 421	Lab Course 5 (CHE-411)	3	1.5	50	10	40	20
	CHE 422	Lab Course 6 (CHE-412)	3	1.5	50	10	40	20
SEC	CHE 413 Select any one from SEC-2A & SEC-2B	CHE413 SEC-2A **Pharmaceuticals Chemistry**	2	2	50	10	40	20
		CHE413 SEC-2B **Industrial Fermentation & Alcohol Technology**	2	2	50	10	40	20
Total Credits for Semester IV: 07+02 (Theory:04+02; Laboratory: 03)								

Practicals exam of both III and IV semester will be conducted at the end of second term

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Semester V								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1C) Core Courses	CHE 511	Core Course (Theory Paper IX) Organic Chemistry	2	2	50	10	40	20
	CHE 512	Core Course (Theory Paper X) Physical Chemistry	2	2	50	10	40	20
	CHE 521	Lab Course 7 (CHE-511)	3	1.5	50	10	40	20
	CHE 522	Lab Course 8 (CHE-512)	3	1.5	50	10	40	20
SEC	CHE 513	Select any one from SEC-3A & SEC-3B	2	2	50	10	40	20
Total Credits for Semester III: 07+02 (Theory:04+02; Laboratory: 03)								

Semester VI								
	Course Code	Course Title	Teaching hr/ Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional (DSC-1D) Core Courses	CHE 611	Core Course (Theory Paper XI) Inorganic Chemistry	2	2	50	10	40	20
	CHE 612	Core Course (Theory Paper XII) Applied Chemistry	2	2	50	10	40	20
	CHE 621	Lab Course 9 (CHE-611)	3	1.5	50	10	40	20
	CHE 622	Lab Course 10 (CHE-612)	3	1.5	50	10	40	20
SEC	CHE 613	Select any one from SEC-4A & SEC-4B	2	2	50	10	40	20
Total Credits for Semester IV: 07+02 (Theory:04+02; Laboratory: 03)								

Practicals exam of both V and VI semester will be conducted at the end of second term

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BSc V Semester
DSC IA (1) Core course (Theory Paper IX)
CHE-511 Organic Chemistry
Credits 02 **45 Lectures**

UNIT-1 [15 Lectures]

a) Rearrangement Reactions

Introduction, Types of rearrangement, Types of reactive intermediate involved in different rearrangements, Rearrangement with mechanism – Beckmann, Baeyer-Villiger, Favorskii, Curtius, Lossen, Schmidt.

b) **Reagents in Organic Synthesis**

Applications of following reagents.

i) Reducing Reagents:

$LiAlH_4$, $NaBH_4$, DIBAL-H, $Li(tBuO)_3AlH$ & Raney Nickel.

ii) Oxidizing Reagents:

DMSO either with DCC or Ac_2O, Dess Martin reagent, OsO_4, SeO_2, DDQ

UNIT-II [15 Lectures]

a) Designing Organic Synthesis (Retrosynthetic Analysis)

Introduction, Different terms used – Disconnection, Synthons, Synthetic equivalence, FGI, TM. One group disconnection: Retrosynthesis and Synthesis of target molecules: Acetophenone, Crotonaldehyde, Cyclohexene, Benzyl benzoate,

b) Carbohydrates

Introduction, classification of carbohydrates, structures of glucose and fructose and biological significance. Concept of anomers, epimers, reducing and non-reducing sugars, mutarotation, inversion. Reactions of glucose with acid, base, phenyl hydrazine, oxidizing agents, reducing, Glycosidic bonds.

UNIT-III [15 Lectures]

a) Amino acids

Amino acids: classification of amino acids. Concept of ampholytes, isoelectric pH, zwitter ions, titration curve of glycine. Reactions of amino acid with Ninhydrin, Sanger's, Dansyl chloride, and Edmann's reagents and their significance. Peptide bond and it features.

b) **Proteins:**

Classification based on function, nutrition and composition. Structural organization of proteins- primary, secondary, tertiary and quaternary structures

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Text/ Reference Books

1. Organic Chemistry, R.T. Morrison & R.N. Boyd: 7th edition, Prentice Hall.
2. Organic Chemistry: Clayden, Greeves, Wothers, Warren, Oxford Press.
3. Organic Chemistry: Graham Solomans
4. E. S. Gould: Mechanism and Structure in Organic Chemistry
5. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman
6. Organic Chemistry (Vol. I & II), E.L.B.S. I.L. Finar:
7. Reactions, Rearrangements and Reagents S. N. Sanyal:
8. Lehninger's Principles of Biochemistry, by Nelson and Cox Macmillan Publisher 4th Edn.
9. Biochemistry by U. Satyanarayana
10. Harper's Illustrated Biochemistry, 26th Edition
11. Biophysical techniques by Upadhyay and Nath, 3rd revised edition.

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BSc V Semester

DSC IA (2) Core course (Theory Paper X)

CHE-512 (Physical Chemistry)

Credits 02 **45 Lectures**

UNIT I [15 Lectures]

Electrochemical Cells

Electrochemical cells, reversible and irreversible cells with examples, The e.m.f. of electrochemical cell and its measurement, The Weston standard cell, Reference electrodes: The primary reference electrode and Secondary reference electrodes, The Nernst equation for E.M.F. of a cell. Types of reversible electrodes, the sign convention for electrode potentials, Thermodynamics of reversible cells and reversible electrodes, E.M.F. and equilibrium constant of cell reaction, Electrochemical series, Applications of emf measurements by using hydrogen electrode, quinhydrone electrode and glass electrodes: 1. Determination of pH of a solution 2. Potentiometric titrations: i) Acid-base titrations, (ii) Redox titrations. (iii) Precipitation titration,

UNIT-II [15 Lectures]

a) Colligative properties of dilute solution

Introduction, Solution, electrolytes and nonelectrolytes, Meaning of term colligative property, relative lowering of vapour pressure of solvent in solution, elevation of B.P. of solvent in solution, Landsberger's method, freezing point depression, Beckmann's method, Osmosis and Osmotic pressure, Berkeley and Hartley method, application of colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight, Relation between Vant Hoff's factor and degree of dissociation of electrolyte by colligative property, Numerical

b) Nano Materials:

Introduction to nanomaterials, Methods of synthesis

1) High energy ball milling
2) Physical vapour deposition (PVD)
3) Chemical vapour deposition (CVD)
4) Microemulsion , synthesis using micro organisms and plant extracts

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UNIT -III [15 Lectures]

a) Electrophoresis

Introduction, Principle and theory of electrophoresis, Different types of electrophoresis techniques, Moving Boundary Electrophoresis, Zone electrophoresis- Paper, Cellulose acetate and Gel electrophoresis, Applications of electrophoresis

b) Ideal and real solutions

Introduction, chemical potential of liquids - ideal solutions, ideal dilute solutions - Raoult's and Henry's Law, liquid mixtures, phase diagram of binary systems : liquids -vapour pressure diagrams, temperature composition diagrams, liquid-liquid phase diagrams, solubility of partially miscible liquids-critical solution temperature, effect of impurity on partially miscible liquids, Problems

REFERENCE BOOKS

1 Atkins' Physical Chemistry by Peter Atkins, Julio de Paula, James Keeler -11th edition

2. Principles of Physical chemistry by B.R. Puri, L.R. Sharma, M.S. Pathania

3. Essentials of Physical chemistry by Bahl Tuli-Revised, S. Chand and Company Ltd.

4. Principles of Physical Chemistry, Fourth Edition by S.H. Marron and C. F. Pruton

5. Physical-Chemistry-4th Edition - Gilbert W. Castellan Narosa

6. Vogel's Textbook of quantitative Chemical Analysis, 5th Ed. G. H. Jeffry, J. Basset, J. Mendham, R. C. Denney, Longman Scientific and Technical,.

7. Basic Concept of Analytical Chemistry, S. M. Khopkar, New Age International (UK) Ltd, United Kingdom

8. Analytical Chemistry, G.R. Chatwal, Sham Anand.

9. Instrumental Methods of Chemical Analysis, Chatwal and Anand

10. An introduction to nano materials and nanoscience Asim k Das, Mohua Das

11. Nano technology Thomas Varghese & K M Balkrishna

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BSc V Semesters
Core course (Lab course 7)
CHE-521 Organic Chemistry

Credits 1.5 **60 Lectures**

A) Preparations

a) Green Chemistry Preparations (Any Two)

1. Nitration of phenol or substituted phenols using $CaNO_3$.
2. Green synthesis of benzhydrol from benzophenone.
3. Green synthesis of acetanilide from aniline using Zn / acetic acid.

b) Organic Preparations (Any Two)

1. Preparation of 1, 4- dihydropyrimidinone from ethyl acetoacetate, benzaldehyde and urea using oxalic acid as catalyst.
2. Preparation of β-naphthyl methyl ether from β-naphthol. (Methylation by DMs, NaOH).
3. Preparation of 4-methyl-7-hydroxy coumarin from resorcinol.
4. Preparation of Hippuric acid from Glycine.

B) Interpretation of IR and NMR spectra (3 Experiments of each type)

1. Determination of functional group of organic compound from given IR spectra.
2. Determination of structure of organic compound from given NMR spectra.

(Ethyl alcohol, Cis-2-butene, Trans-2-butene, Benzoic acid, Propanaldehyde, Ethyl methyl ether, 1 Butyne, Ethyl acetate, Propyl Cyanide, Salicylic Acid, Nitro phenols, Isopropyl benzene, Propanamine, Benzamide, n-Pentane, 2-chloro butane, Acetophenone)

C) Organic Estimations (Any Two)

1. Estimation of glycine
2. Saponification value of oil
3. Estimation of Alkali content in Antacid using HCl.
4. Estimation of acetone
5. Estimation of ethyl benzoate

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BSc V Semester
Core course (Lab course 8)
CHE-522 Physical Chemistry

Credits 1.5 **Lectures 60**

A. Refractometry: (any two)

1. To determine the specific refractivity's of the given liquids A and B and their mixture and hence determine the percentage composition their mixture C.
2. To determine the molecular refractivity of the given liquids A, B, C and D.
3. To determine the molar refraction of homologues methyl, ethyl and propyl alcohol and show the constancy contribution to the molar refraction by -CH2 group.
4. Determine the refractive index of a series of salt solutions and determine the concentration of a salt of unknown solution

B. Spectrophotometry and Colorimetry : (any Six)

1. To titrate Cu^{2+} ions with EDTA photometrically
2. To determine the indicator constant of methyl red indicator
3. To estimate of Fe^{3+} ions by thiocyanate method
4. Cobalt by using R-nitroso salt method
5. To determine the dissociation constant of dibasic acid (Malonic acid)
6. To determine the order of reaction for the oxidation of alcohol by potassium dichromate and potassium permanganate in acidic medium calorimetrically
7. Simultaneous determination of Cu^{2+} and Ni^{2+} ions by colorimetry/spectrophotometry method
8. To determine the normality of citric acid in given fruit by titrating it against standard NaOH solution by conductometric method
9. To determine λ_∞ of strong electrolyte (NaCl or KCl) and to verify Onsager equation
10. To estimate the amount of lead present in given solution of lead nitrate by conductometric titration with sodium sulphate
11. To determine the relative strength of monochloro acetic acid and acetic acid conductometrically
12. To study the effect of substituents on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid

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D. Viscosity : (any one)

1. To determine the molecular weight of a high polymer by using solutions of different concentrations
2. Determine the radius of glycerol molecule from viscosity measurement.
3. Study the variation of viscosity of sucrose solution with the concentration of solute

3. Colligative properties (any Two)

1. To determine the molecular weight of solute by depression in freezing point method
2. To study the association of Benzoic acid in benzene by Beckmann Method
3. Determine the molecular weight of given electrolyte and non-electrolyte by Landsberger's method and to study the abnormal molecular weight of electrolyte

4. Turbidometry: (any one)

1. determination of SO4-2 by turbidimetric method (Turbidimetric titration or calibration curve method
2. To determine the molecular weight of a given polymer by turbidometry

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Note **Select any one Skill enhancement course from SEC-3A and SEC-3B**

SEC -3A
(1-Cosmetics)

(Theory Paper Credits: 2, 45 Lectures)

UNIT I [15 Lectures]

Classification of cosmetic and cosmeceutical products Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals, from cosmetics, cosmetics tis quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem a .sociat d with teeth and gums.

Unit II [15 Lectures]

Principles of formulation and building blocks of skill care products:

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals.

Antiperspants & deodorants- Actives & mechanism of action.

UNIT III [15 Lectures]

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

References

1)Harry's Cosmeticolcgy, Wilkinson, Moore, Seventh Edition, George Godwin.
2)Cosmetics - Formulations, Manufacturing and Quality Control, .P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3)Text book of cosmeticology by Sanju Nanda & Roop K, Khar, Tata Publishers.

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SEC- 3B

(2- Jam, Jelly, Sauce And Ketchups)

Theory Paper **Credits: 2** **45 Lectures**

UNIT I : [15 Lectures]

Food safety education and training: introduction, need for education and training,
Food Safety and Standards Authority in India (FSSAI): Introduction, functions & duties, provisions for food products
Food laws and regulations:
Prevention of food adulteration act (PFA act) - introduction, features of act, implementation
Essential Commodity Act (ECA) - Fruit Product Order (FPO), Vegetable Oil Product Order,
Export act, Bureau of Indian Standards Act (BIS), Agmark, ISI mark, ISO, FAO, WHO

UNIT II : [15 Lectures]

a) JAM, JELLY, MARMALADE :

Introduction Jam, Jelly, Marmalade, Definition of Jam and Jelly, Difference between Jam and Jelly. Colloidal System in Jelly, Chemistry of Jam making, Structure of Pectins, Colors and Preservatives used in jams, jellies and marmalades.

b) Sauce and Ketchups Introduction and Colors :

Introduction Brief History, Definition and concept of Sauce and Ketchup, Principle, Components and Ingredients of sauces and ketchups, Chemistry of Ketchup, Different Types of Sauce and Ketchups, Difference between Sauce and Ketchup, Additive edible colors types and examples

UNIT III : [15 Lectures]

Preservatives in Sauce and Ketchups,

Definition of Chemical Preservatives, their advantages and disadvantages; Use and proportions of different preservatives in Ketchup and Sauces, Edible Colors and their advantages and disadvantages, Different types of Sauces. Technique of Sealing of Bottles or jars for commercial use

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BSc VI Semester

DSC 1A(1) Core course (Theory Paper XI)

CHE-611 Inorganic Chemistry

Credits: 2, 45 Lectures

UNIT -I [15 Lectures]

a) Metal Carbonyls

Definition of Organometallic compounds and Organometallic chemistry, CO as a π-acid donor ligand, binary metal carbonyls, classification of metal carbonyls, synthesis of metal carbonyls; (a) Direct reaction (b) Reductive carbonylation (c) Photolysis and thermolysis. Structure of M(CO) $Ni(CO)_4$, $Mn_2(CO)_{10}$, $Fe(CO)_5$, $Fe_2(CO)_9$ Hepticity, Molecular and electronic structures of binary metal carbonyls, Electron count in complexes (18 electron rule).

b) **Inorganic solids/ Ionic liquids of technological importance**

Inorganic solids, Preparation of inorganic solids: Conventional heat and beat methods, Co-precipitation method, Sol-gel method and Hydro-thermal method.

UNIT -II [15 Lectures]

a) Catalysis

Introduction and types of Catalysis, basic principles, activity and selectivity in catalysis, Types of catalysis, homogeneous vs. heterogeneous catalysis, importance of catalysis in the synthesis of high value chemicals.

Homogeneous catalysis: catalytic cycles for following reactions: a) Hydrogenation of olefins using Wilkinson complex, b) Hydroformylation of olefins using Cobalt and Rhodium complexes,

b) Chemistry of Zeolites

Historical Background, Natural and artificial Zeolites, Zeolite Framework Types: Classification, Nomenclature, Database of Zeolite Structures, Channels, Building Units, Natural Tiles, Framework Density, Coordination Sequences, Zeolite Structures: Framework Composition, Extra-framework Species, Stacking Faults and Disorder, Synthesis of Zeolites: Introduction, Basic Zeolite Synthesis.

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UNIT -III [15 Lectures]

a) Metals and Semiconductors

Introduction, Metallic bonding, Band theory in metals with respect to Na along with n(E) and N(E) diagrams, Electrical conductivity of metals (Na, Mg, Al), Valence electrons and conductivity of metals, Effect of temperature and impurity on electrical conductivity of metals Semiconductors, types of Semiconductors: I. Intrinsic II. Extrinsic, effect of temperature and impurity on semi conductivity, n & p type semiconductors ZnO and NiO, Superconductivity: Discovery, property, models, structure and superconductivity, low and high temperature superconductors, applications of superconductors

b) Inorganic Reaction Mechanism

Basic concepts of stability and lability, stability constants, Factors affecting lability, chelate effect. Classification of inorganic reactions, ligand substitution reactions: Intimate and stoichiometric mechanism of ligand substitution. Substitution Reactions in Four Coordinated square planar complexes: Trans effect and Trans effect series, applications of trans effect, stereochemistry of substitution.

REFERENCE BOOKS

1. Solid State Chemistry: An Introduction, Lesley E. Smart, Elaine A. Moore, 3rd Edn.
2. Solid State Chemistry and its Applications, Anthony R. West, Second Edition, Wiley
3. Chemistry by Raymond Chang - 5th edition (Related Pages)
4. New Guide to Modern Valence Theory by G.I. Brown –
5. Concise Inorganic Chemistry by J.D. Lee - 5th Edn

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BSc VI Semester

DSC 1A(2) Core course (Theory Paper XII)

CHE-612 Applied Chemistry

Credits: 2, 45 Lectures

UNIT -I [15 Lectures]

a) Parameters of instrumental analysis

Techniques, Methods, Procedures, and Protocols, Selecting an Analytical Method, Accuracy, Precision, Sensitivity, Selectivity, Robustness and Ruggedness, Scale of Operation, equipment, Time, and Cost, Making the Final Choice, Developing the Procedure, Calibration and Standardization, Sampling, Validation, Protocols

b) **Nanomaterial Analysis**:

Principle, working and applications of Powder X-ray diffraction (XRD); X-ray photoelectron spectroscopy (XPS); Auger Spectroscopy; Scanning electron microscopy (SEM); Transmission electron microscopy (TEM); Low-energy electron diffraction (LEED); Atomic Force Microscopy (AFM)and Dynamic light scattering (DLS) techniques

UNIT -II [15 Lectures]

a) Nuclear Magnetic Resonance (NMR/PMR)

Introduction, Principles, chemical shift, shielding, & deshielding effect. Measurement of chemical shift, TMS reference, peak area, integration, spin-spin coupling, coupling constants, J-value , problems based on NMR **Combined problems based on U.V. I.R. and NMR**

b) Mass Spectroscopy

Introduction, Basic theory, Nature of mass spectrum, Importance of molecular ion peak, isotopic peaks, base peak, nitrogen rule, rule of 13 for determination of empirical formula and molecular formula. Fragmentation pattern of compounds upto 5 carbons -aldehydes, ketones, alkyl halides and alcohols

UNIT -III [15 Lectures]

a) High Performance Liquid Chromatography

Introduction, Types of liquid chromatography (liquid-solid, liquid-liquid, bonded phases), Choice of mode of separation, Equipment for HPLC: mobile phase, sample injection and column design (mobile phase, optimization of mobile phase, gradient elution, solvent delivery and sample injection, sample injection system, the column

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(effect of column length and column diameter), Choosing the Detector, Ultraviolet detector, Luminescence detector, RI detector, electrochemical detector, Column efficiency, HPLC chromatogram and its characteristics (retention time, peak height, peak area), method of quantitative analysis by HPLC, Example: determination of aspirin, phenacetin and caffeine in a mixture, numerical,

b) Gas Chromatography

Introduction, Apparatus: A supply of carrier gas from a high-pressure cylinder, Sample injection system and derivatization, the column (Packed columns, Open tubular columns), the detector (properties, hot wire detector or TCD, FID, ECD), Quantitative analysis by GC (Area normalization method and internal standard addition method), Elemental analysis, numerical

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BSc VI Semester
Core course (Lab course -9)
CHE-621 Inorganic Chemistry
Credits 1.5 60 Lectures

A. Estimations any Four

1. Estimation of Zn from Brass alloy .
2. Estimation of Copper iodometrically from nichrome alloy.
3. Estimation of Tin gravimetrically as SnO_2 from solder alloy.
4. Analysis of Phosphate $(PO_4)^{3-}$ from Fertilizer.
5. Analysis of Iodine from Iodized salt.
6. Strength of medicinal H_2O_2.
7. Mn by Volhard's method.
8. Analysis of Cu from Cu-Fungicide.

B. Flame Photometry (Any One)

1. Estimation of Na by flame photometry by calibration curve method.
2. Estimation of Na by flame photometry by regression method.
3. Estimation of K by flame photometry by calibration curve method.
4. Estimation of K by flame photometry by regression method.

C. Nanomaterial synthesis (Any One)

1. Synthesis of Silver nanoparticles.
2. Synthesis of ZnO nanoparticles.

D. complexes synthesis (Any Two)

1. Synthesis of amine complexes of Ni(II) and its ligand exchange reaction (bidentate ligands like acac, DMG, Glycine) by substitution method.
2. Determination of the Metal to ligand ratio (M: L) in complexes
3. Solvent free microwave assisted one pot synthesis of phthalocyanine copper (II) complex.
4. Fenton reaction: Degradation of H_2O_2 using Fe catalyst.

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BSc VI Semester
Core course (Lab course -10)
CHE-622 Applied Chemistry
Credits 1.5 **60 Lectures**

a. Analysis of Inorganic materials of industrial importance (Any two)

1. Synthesis of calcium ammonium nitrate fertilizer and estimation of calcium in the fertilizer.
2. Estimation of phosphoric acid in superphosphate fertilizer.
3. Determination of composition of dolomite (by complexometric titration

b) Organic Extractions (Any Three)

1. Caffeine from tea leaves
2. Eugenol from cloves
3. Lycopene from tomato peels
4. Cinnamic acid from cinnamon
5. Trimyristin from nutmeg
6. Citronella oil from lemongrass

c) Column chromatography

1. Separation of mixture of aldehyde and carboxylic acid by column chromatography
2. Separation of mixture of o-nitrophenol and p-nitrophenol by column chromatography

d) Project report writing based on Industrial tour during the year

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Note **Select any one Skill enhancement course from SEC4A and SEC4B**

SEC-4A

(1. Industrial waste water treatment)

Theory Paper **Credits: 2** **45 Lectures**

Wastewater Treatment:

Pre & Primary Treatment - screening, comminuting, grit removal, flow measurement. Primary sedimentation Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction. Waste Treatment Methods - Nitrification and De-nitrification-Phosphorous removal –Heavy metal removal, Membrane Separation Process - Air Stripping and Absorption Processes, Special Treatment Methods - Disposal of Treated Waste Water.

Secondary Treatment: Activated sludge. Trickling filters. Stabilisation pond. Up-flow anaerobic sludge blanket reactor.

Tertiary Treatment: Wastewater disposal and reuse. Nutrient removal. Solid removal. Ozone treatment. Reverse osmosis. Ultraviolet filtration. Ion exchange. Wastewater disposal. Water reuse. Concept of common effluent treatment plant (CETP).

Books for Reference:

1) Natural Hazards-Local, National, Global: G. F. White, Oxford University Press.

2) Laboratory Manual for the Examination of Water, Waste water and soil: H. H. Rupa and H. Krist;

VC H Publication

3) Environmental Impact Analysis Handbook: J. G. Rau and D. C. Wooten; McGraw-Hill Book Co.

4) Environmental Impact Assessment, L. W. Canter, McGraw Hill Publication,

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SEC-4B

(2. Purification and Separation techniques)

Theory Paper **Credits: 2** **45 Lectures**

Principles, efficiency and techniques involved in

1. Filtration,
2. Distillation,
3. Fractional distillation
4. Steam distillation
5. Vacuum distillation
6. Solvent extraction

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