Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Science
Department of Chemistry
Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH201	PG	Main Group Chemistry and Inorganic Photochemistry	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. To give basic knowledge of the concept of Non-Transition Metal Chemistry & Transition Metal Chemistry.
2. To develop an understanding of Group Theory and Collision Theory.
3. Enable students to apply the concepts of the Laws of Photochemistry.
4. The purpose of the course is to make the students to understand the concepts and practical applications of Main Group Chemistry and Inorganic Photochemistry.

COURSE OUTCOMES:

After completion of this course, the students are expected to demonstrate the following skills, knowledge, and attitudes. Students will be able to understand:

1. Theoretical understanding of the concept of Non-Transition Metal Chemistry & Transition Metal Chemistry.
2. Became aware of the Group Theory and Collision Theory.
3. Students will be able to apply the concepts of the Laws of Photochemistry.
4. The students will be able to understand the practical applications of Main Group Chemistry and Inorganic Photochemistry.

SYLLABUS:

UNIT I: NON-TRANSITION METAL CHEMISTRY

Synthesis, Properties, Structure, and Bonding of Nitrogen, Phosphorous, Sulfur, Pseudohalogen, Interhalogen, and Xenon Compounds; Boranes, Carboranes, Metallocarboranes, Borazines, Phosphazenes, Sulfur-Nitrogen compounds, silicates, silicones. Iso- and Hetero-poly anions. Redox Reactions: Latimer diagram, Electrochemical Series. Acids and Bases: Lewis acids and bases; HSAB concept.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Science
Department of Chemistry
Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH201	PG	Main Group Chemistry and Inorganic Photochemistry	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT II: TRANSITION METAL CHEMISTRY

Nomenclature, Isomerism, Chelate effect, Macrocyclic ligands. Bonding in Coordination Complexes: Crystal-Field theory, d-orbital Splitting in Octahedral, Tetrahedral, Square Planar geometries; Molecular Orbital Theory, p-bonding; Jahn-Teller effect, Spectrochemical series, nephelauxetic series. Electronic Spectra: d-d transitions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra. Magnetism: Types, determination of magnetic susceptibility, spin-only formula, spin-orbit coupling, spin crossover.

UNIT III: GROUP THEORY

Definition of group, symmetry, point groups, representation of group, orthogonality theorem, irreducible representation, character table, direct sum, direct product, derivation of projection operator. Spectroscopy: Electromagnetic radiation and its interaction with matter. Uncertainty principle: Natural line width and broadening.

UNIT IV: COLLISION THEORY (DETAILED TREATMENT)

Outline of Transition State theory. Primary kinetic salt effect. Lindemann theory of unimolecular reaction. Potential energy curves (diatomic molecules), Frank-Condon principle and vibrational structure of electronic spectra. Bond dissociation and principle of determination of dissociation energy (ground state). Decay of excited states by radiative and non-radiative paths. Fluorescence and phosphorescence, Jablonski diagram.

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH201	PG	Main Group Chemistry and Inorganic Photochemistry	3	0	0	3	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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UNIT V: LAWS OF PHOTOCHEMISTRY

Grotthus-Draper law, Stark-Einstein law of photochemical equivalence and Lambert-Beer's law; quantum yield and its measurement for a photochemical process, actinometry. Photo stationary state. Photosensitized reactions. Kinetics of HI decomposition, H_2-Br_2 reaction, dimerization of anthracene

TEXT BOOKS:

1. Lee, J. D. Concise Inorganic Chemistry, ELBS, 1991.
2. Douglas, B.E. and McDaniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970
3. Atkins, P.W. & Paula, J. Physical Chemistry, Oxford Press, 2006.
4. Chemical Applications of Group Theory by F.A. Cotton, Wiley Interscience, 1990, 3rd Ed.
5. Fundamentals of Molecular Spectroscopy by C. N. Banwell and E. M. McCash, Tata McGraw Hill, 1994.

REFERENCE BOOKS:

1. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.
2. Laidler, K.J. Chemical Kinetics, Pearson Education:New Delhi 2004
3. Group Theory and Quantum Mechanics by M. Tinkham, McGraw Hill, 1964.
4. Introduction to Molecular Spectroscopy by G. M. Barrow, McGraw Hill

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Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH202	PG	Physical Organic Chemistry	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. To give basic knowledge of the concept of Chemical kinetics and its significance
2. To develop an understanding of Surface phenomena and catalysis and Huckel theory and LFE.
3. Enable students to apply the concepts of Coordination chemistry, Structure, conformations of organic molecules, and the concept of aromaticity.
4. The purpose of the course is to make the students understand the concepts and practical applications of Physical Organic Chemistry

COURSE OUTCOMES:

After completion of this course, the students are expected to demonstrate the following skills, knowledge, and attitudes. Students will be able to understand:

1. Theoretical understanding of the concept of Chemical kinetics and its significance
2. Became aware of the Surface phenomena and catalysis and Huckel theory and LFE.
3. Students will be able to apply the concepts of Coordination chemistry, Structure, conformations of organic molecules and the concept of aromaticity.
4. The students will be able to understand the practical applications of Physical Organic Chemistry.

SYLLABUS:

UNIT I: CHEMICAL KINETICS AND ITS SIGNIFICANCE

Recapitulation Complex Reactions: Reactions approaching equilibrium, steady state approximation, Rate laws for consecutive, opposing, and parallel reactions, explosive reactions. Techniques to study gas phase reactions. Fast reactions: relaxation, stop flow, and flash photolysis. Kinetics of enzyme reactions. Harpoon mechanism (Molecular Beam method).

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
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Department of Chemistry
Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH202	PG	Physical Organic Chemistry	3	0	0	3	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Activated complex theory: Reaction coordinate and the transition state, potential energy surface, concentration of activated complex, and rate constant.

UNIT II: SURFACE PHENOMENA AND CATALYSIS

The heat of adsorption, Langmuir and BET isotherms, estimation of surface thermodynamics of chemisorption. Adsorption in liquid systems and surface films. General features of homogeneous and heterogeneous catalysis, catalytic activity, and strength of chemisorption, sticking probability, the kinetics of adsorption and desorption, promoters and poisons, catalyst support, methods of preparation of heterogeneous catalysts, catalyst characterization, Important industrial catalysts (three), phase transfer catalysis.

UNIT III: COORDINATION CHEMISTRY, STRUCTURE, AND REACTIONS

Coordination Chemistry–Reaction Mechanism: Kinetics and mechanism of reactions in solution–labile and inert complexes, Ligand displacement reactions in octahedral and square planar complexes, acid hydrolysis, base hydrolysis and anation reactions, trans effect, theory, and applications. Electron transfer reactions, electron exchange reactions – complementary and non-complementary types – inner sphere and outer sphere processes, isomerization and racemization reactions of complexes.

UNIT IV: STRUCTURE, CONFORMATIONS OF ORGANIC MOLECULES, AND CONCEPT OF AROMATICITY

Structure and reactivity of organic molecules with respect to chemical bonding, and correlation of structure with reactivity. Concept of aromaticity, antiaromaticity example, and structure of molecules. Different types of reactive intermediates and their importance in different reactions,

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH202	PG	Physical Organic Chemistry	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
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fundamental concepts of chemical and biochemical catalysis. Conformational analysis, introduction to molecular mechanics, and quantum chemical calculations. Symmetry operations, stereochemistry and Stereo electronic effects. Non-covalent interactions and solvent effects.

UNIT V: HUCKEL THEORY AND LFE

Hückel theory for conjugated hydrocarbons, Different forms of conjugation and aromaticity. Construction of molecular orbitals for important organic molecules and functional groups. Molecular recognition and supramolecular chemistry. Kinetic isotope effects. Linear free energy relationships. Acidity, nucleophilicity, electrophilicity. Reactive intermediates (cationic, anionic, radical, carbene and nitrene) and reaction mechanisms. Apply different techniques for the determination of mechanisms of organic reactions.

TEXT BOOKS:

1. Chakrabarty, D. K. (Reprint 2007), Adsorption and Catalysis by Solids, New Age International Publishers, New Delhi.
2. Bond, G. C. (1974), Heterogeneous catalysis: Principles and applications Clarendon Press, Oxford .
3. Laidler,K. J., (1987)Chemical Kinetics, Third Edition, Pearson Education, Noida (India).
4. Levine, R.D., Molecular reaction Dynamics, (2009), Cambridge University Press, NY. (Paperback Edition)
5. Raja Ram J. and Kuriacose J.C., (1993).Kinetics and Mechanism of Chemical Transformations, MacMillan Indian Ltd., New Delhi
6. Rakshit,P.C.,(2004) Physical Chemistry, 7th Edition, Sarat Book Distributors, Kolkata.
7. Day, M.C and Selbin,J (1985): Theoretical Inorganic Chemistry, 2nd Edition , Affiliated East West Press Pvt.Ltd.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH202	PG	Physical Organic Chemistry	3	0	0	3	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

REFERENCE BOOKS:

1. Basolo, F. and Pearson, R.G (1967): Mechanism of Inorganic Reactions, John Wiley, New York.
2. Carey F.A., and Sundberg R.A., (2007): Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th Edition, Springer, New York.
3. Isaacs N., Physical Organic Chemistry, 2nd Edition, Addison-Wesley-Longman, 1995.
4. March J., and Smith B. M., (2013): Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Edition; John-WileyISBN: 978-0-470-46259-1; April, 2080 pages.
5. Eliel, E. L.; Wilen, S. H. (1994): Stereochemistry of Organic Compounds. Wiley.

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Shri Vaishnav Institute of Science
Department of Chemistry
Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH203	PG	Medicinal Chemistry	3	0	0	3	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. To give basic knowledge of concept of Medicinal Chemistry, Drug Design & Development.
2. To develop the understanding of Introduction, classification, synthesis, and SAR of old and new drugs
3. Enable students to apply the concepts of Combinatorial Chemistry.
4. The purpose of the course is to make the students to understand the concepts and practical applications of Medicinal Chemistry.

COURSE OUTCOMES:

After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes. Student will be able to understand:

1. Theoretical understanding of concept of Medicinal Chemistry, Drug Design & Development
2. Became aware of the Introduction, classification, synthesis, and SAR of old and new drugs .
3. Students will be able to apply the concepts of Combinatorial Chemistry.
4. The students will be able to understand the practical applications of Medicinal Chemistry.

SYLLABUS:

UNIT I: Introduction to Medicinal Chemistry

Introduction to Medicinal Chemistry, History of Medicinal Chemistry, Classification of drugs, Important Terminology used in Medicinal Chemistry,

Pharmacokinetics: Introduction to drug absorption, disposition, drug metabolism, elimination, important pharmacokinetic parameters in defining drug disposition and in therapeutics, mention of uses of pharmacokinetics in drug development process, concept of pro drug and soft drug.

Pharmacodynamics: Introduction, principles of drug action, mechanisms of drug action,

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Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH203	PG	Medicinal Chemistry	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

introduction to the concept of receptors and drug receptor interactions, Dose-response relationships, drug potency and efficacy, combined effect of drugs.

UNIT II: Drug Design & Development

Drug Design & Development, History and development of SAR and QSAR, Physiochemical parameters, Lipophilicity, electronic parameters, steric parameters, Shelton and surface activity parameters and redox potentials, Free Wilson and Hansch analysis, other statistical methods.

UNIT III: Introduction, classification, synthesis and SAR of old and new drugs I

Antibiotics: Introduction, classification.

a) β-lactam antibiotics: penicillin, Classification (early, resistant, broad spectrum, broad spectrum,adverse effects of penicillins.SAR of penicillin, Synthesis: ampicillin, mode of action
b) Cephalosporin: introduction, classification, SAR, mode of action
c) Tetracyclines: introduction, classification, SAR, mode of action
d) Sulphonamide: introduction, classification, SAR, mode of action
e) Quinolones: introduction, classification, SAR, mode of action

Anasthetics, Antidipressants, Oral anticoagulants. (Introduction, classification, SAR.)

UNIT IV: Introduction, classification, synthesis, and SAR of old and new drugs II

Antihistamines and anti-ulcer drugs, Diuretics, Antihypertensive, Cholinergic drugs, Narcotic Analgesics, Sedatives, Hypnotics, Anxiolytics, Antianginal, Oral Hypoglycemic (Introduction, classification & SAR).

UNIT V: Combinatorial Chemistry

Including automation, solid supported and solution phase of synthesis (SPPS & SPOS concept) and related other methodologies, preparation, and study of targeted or focused libraries.

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							THEORY		PRACTICAL		
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MSCH203	PG	Medicinal Chemistry	3	0	0	3	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Medicinal Chemistry, A. Burger Vols. I to V Ed. M. E. Wolff, John Wiley.
2. Goodman & Gilman. Pharmacological Basis of Therapeutics, McGraw-Hill .
3. S. S. Pandeya & J. R. Dimmock. Introduction to Drug Design,New Age International.
4. D. Lednicer. Strategies for Organic Drug Synthesis and Design,John Wiley .
5. Graham & Patrick. Introduction to Medicinal Chemistry (3rd edn.), OUP
6. Medicinal Chemistry — A molecular and Biochemical Approach,Thomas Nogrady and Donald F. Weaver
7. Principles of Medicinal Chemistry, W. O. Foye

Reference Books:

1. Wilson and Gisvolds Text book of Medicinal Chemistry
2. The Organic Chemistry of the Drug Design and Drug Action,Richard B. SilvermanS
3. Analogue based Drug Discovery, János Fischer and C. Robin Ganellin
4. Goodman and Gilmans Text book of Pharmacology.
5. Chemoinformatics - Concepts, Methods, and Tools for Drug Discovery,Jürgen Bajorath
6. A Kar, Textbook of Medicinal Chemistry; Asian Age Publication.
7. Sriram D and Yogeshwari P, Medicinal Chemistry; Pearson Education.
8. Ahluwalia V K, Chopra Madhu, Medicinal Chemistry; Ane Books India.

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							THEORY		PRACTICAL		
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MSCH204(A)	PG	Leather Chemistry & Technology	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. To give basic knowledge of concept of Leather Chemistry & Chemicals in tanning.
2. To develop the understanding of Vegetable & Oil Tanning
3. Enable students to apply the concepts of Combination Tannages.
4. The purpose of the course is to make the students to understand the concepts and practical applications of Leather Chemistry.

COURSE OUTCOMES:

After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes. Student will be able to understand:

1. Theoretical understanding of concept of Leather Chemistry & Chemicals in tanning.
2. Became aware of the Vegetable & Oil Tanning.
3. Students will be able to apply the concepts of Combination Tannages.
4. The students will be able to understand the practical applications of Leather Chemistry

Syllabus:

UNIT I LEATHER CHEMISTRY

Introduction - Constituents of Animal Skin - Preparing skins and hides - leaning and soaking - Liming and degreasing- Manufacture of Leather - Leather Tanning - Vegetable Tanning – Chrome Tanning and Mineral Tanning- Dyeing and Fat liquoring – Leather finishing – oil tanning - byproducts.

UNIT II VEGETABLE TANNING

Classification, identification, physical and chemical properties. Study of vegetable tanning materials, preparation of tanning liquors by leaching and preparation of extracts, types of extracts, sulponation of tan liquors, factors involved in vegetable tanning mechanism of vegetable tanning.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH204(A)	PG	Leather Chemistry & Technology	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT III OIL TANNING

Types of oils and fats, their properties, mechanism of oil tanning

UNIT IV CHEMICALS IN TANNING

Reactions of formaldehyde with proteins, mechanism of aldehyde tanning, use of glutaraldehyde and dialdehyde in leather manufacture. Alum Tanning – Chemistry of aluminium salts (chlorides, sulphates) hydrolysis, olation, oxolation, basification effect of masking salts, mechanism of Alum tanning. Zirconium Tanning – Zirconium sulphates, chlorides, hydrolysis basification, mechanism of zirconium tanning, use of zirconium salts in tanning

UNIT V COMBINATION TANNAGES

Application of vegetable oils and syntans in combination in the production of semichrome, Alum, chrome, Alum retan, sulphur -oil-vegetable tannage, chrome zirconium tannage, oil aldehyde tannage – their mechanism, application of iron salts and sodium silicate salts in tanning processes

Text Books:

1. An Introduction to Principles of Leather Manufacture by SS Dutta, Indian Leather Technologists Association, Kolkota
2. Theory and Practice of Leather Manufacture by KT Sarkar
3. Leather Technicians Handbook by JH Sharp house, Lather Producers Association, Northampton, UK
4. Chemistry and Technology of Leather by O'Flaherty, Roddy and Lollar, VoLI and II, Robert E. Krieger Publishing Company, USA

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Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH204 (B)	PG	Nanomaterials	3	0	0	3	60	20	20	00	00

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:
1. To give basic knowledge of concept of Nanomaterials
2. To develop the understanding of nanocrystalline materials and nanocomposites.
3. Enable students to apply the concepts of Preparation methods and processes of Nanomaterials.
4. To develop & learn practical approach of conducting experiments, and analyze experimental data of Nanomaterials

COURSE OUTCOMES:
After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes. Student will be able to understand:
1. Theoretical understanding of concept of Nanomaterials
2. Became aware of the nanocrystalline materials and nanocomposites.
3. Students will be able to apply the concepts of Preparation methods and processes of Nanomaterials.
4. Laboratory work is intended for students to learn conducting experiments, and analyze experimental data of Nanomaterials

SYLLABUS:

UNIT I:
Carbon materials – Allotropes of carbon – Structure of carbon nanotubes – Types of CNTs – Electronic properties of CNTs – Band structure of Graphene – Band structure of SWNT from graphene – Electron transport properties of SWNTs – Scattering in SWNTs – Carrier mobility in SWNTs.

UNIT - II:
Preparation methods: Thermal and ultrasound decomposition methods. Reduction methods. Coprecipitation, spray drying, sol-gel and hydrothermal methods. Capped semiconductor nanoparticles. High energy ball milling and mechanical attrition.

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Shri Vaishnav Institute of Science
Department of Chemistry
Name of Program: M.Sc. (Chemistry) (CBCS) (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCH204 (B)	PG	Nanomaterials	3	0	0	3	60	20	20	00	00

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UNIT – III:
Thermal evaporation. Sputtering. Laser ablation. Chemical vapour deposition. Molecular beam epitaxy. Thermal spraying. Electro and electroless deposition. Characterization techniques: TEM, SEM, AFM and STM. Optical and vibrational spectroscopy.

Unit-IV:
Properties: Quantum wells, wires and dots. Size and dimensionality effects. Excitons. Single electron tunneling. Applications in infrared detectors and quantum dot lasers. Magnetic properties of nanocrystalline materials. Nanostructured ferroelectric materials and their properties.

Unit-V:
Mechanical properties of nanocrystalline materials and nanocomposites. Nanostructured materials in catalysis and electrocatalysis Carbon clusters compounds, Preparation and properties of carbon nanotubes. Inorganic nanotubes and nanorods, nanoporous materials.

Text Books:

1. Ali Javey and Jing Kong, —Carbon Nanotube Electronicsl Springer Science media, (2009).
2. Michael J. O'Connell, —Carbon nanotubes: Properties and Applicationsl, CRC/Taylor & Francis, (2006).

Reference Books:

1. Francois Leonard, —The Physics of Carbon Nanotube Devicesl, William Andrew Inc., (2009).
2. R. Saito and M. S. Drbselmus, —Physical properties of Carbon Nanotubesl Imperial College Press, (1998).

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Shri Vaishnav Institute of Science
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MSCH204(C)	PG	Polymer Chemistry	3	0	0	3	60	20	20	00	00

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COURSE OBJECTIVES:

1. To give basic knowledge of concept of General Chemistry, Technology of Production, Properties and Applications of Polymers.
2. To develop the understanding of fundamentals of various polymers
3. Enable students to apply the concepts of polymers and their probable synthetic pathways.
4. The purpose of the course is to make the students to understand the concepts and practical applications of polymer Chemistry

COURSE OUTCOMES:

After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes. Student will be able to understand:

1. Theoretical understanding of concept of General Chemistry, Technology of Production, Properties and Applications of Polymers.
2. The graduates will become familiar with fundamentals of various polymers.
3. Students will be able to apply the concepts of polymers and their probable synthetic pathways.
4. The students will be able to understand the practical applications of polymer Chemistry.

SYLLABUS:

Unit- I

Concept of macromolecules, Classification, Functionality and principles of polymerization, Different polymerization techniques, Step growth polymerization, Plasma polymerization, Molecular mass average determination, Colligative properties: ebullioscopy, cryoscopy, end group analysis, Membrane Osmometry, Vapour phase osmometry, Light scattering, Ultracentrifugation. Solution viscosity - Intrinsic viscosity, Determination of viscosity average molecular weight, Mark-Howink equation, determination of k and a, Fractionation of polymers-Gel permeation chromatography (GPC).

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Unit-II

Chiral polymers, tacticity, conformation of single molecules, freely jointed chain, random flight model, Average chain dimension. End to end distance, Restirction due to bond angles, Conformation in crystal and microconformation. Secondary bond forces, chain configuration, Spectral methods for the investigation of structure and configuration: IR, NMR (1H and 13C) and ESR, UV-VIS, Raman, Fluoresence and Mass spectroscopic techniques. Basic determination of polymer properties: Ring structure and its significance, chain flexibility and factors affecting it. Property requirements and polymer utilization-Elastomers, fibers and plastics

Unit- III

Importance of polymer blending-Blending techniques. Miscible and immiscible blends, Miscibility through specific interactions. Polymer alloys, Phase diagram of polymers, polymer systems. Blend morphology, characteristics of FTIR, Flourescent spectroscopy, microscopy, Compatibilization of miscible blends, Addition of graft or copolymers. Types of compatibilities: in situ fomerd, separately added polymers. Polymer composites: Role of fiber and matrix in improving composite properties bonding between fiber and matrix. Critical fiber length in short fiber composites. Role of composites in aerospace application. Composite fabrication techniques: Open model process, vacuum bag molding, centrifugal casting, pultrusion. Closed model process-matefed die molding, thermofoaming injection molding.

Unit- IV

Conduction polymers, conduction mechanism applications, Polyacytelene, polyparaphenylenes, polyanilines, polypyrrole, Photoconductive polymers, polymers in nonlinear optics, polymers with piezoelectric, pyroelectric and ferroelectric properties, Polyvinylidine fluoride. Photoresists for semiconductor applications, Negative Photoresists, Positive photoresists, Plasma reversible photoresistors, Electron beam lithography, Liquid crystalline polymers: preparation, properties,

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and applications, Chiral thermometric liquid crystal polymers, Nematic, liquid crystal polymers, Ionic Polymers: ionic crosslinking, Bound polymers and counter ion.

Unit-V

Compounding: additive for thermoplastic and thermosets, Mastication, vulcanization, compounding of latex, Plasticization-Fillers, thermal stabilizers, with special emphasis to PVC, UV stabilizers, antioxidants, flame retardation, Two roll mixing and extruder mixing - advantage of twin – screw extruder Molding: Extrursion, die swell injection molding of thermoplastics and thermosets, transfer molding of thermosets, Plunger molding, blow molding, thermoforming, vacuum forming, casting, calendering, laminating, film production, Industrial polymers: Polyolefins, polyvinyl carbazides, poly acrylics, PMMA, poly methacrylics, polyacrylonitrile. Flourocarbon polymers: PTFE, PCTFE, surface graft treatment, thermosets, epoxy resins, alkyd resins, polyimides, unsaturated polyester, epoxy resins as coating materials. Heat resistant polymers: Poly phenylene oxide (PPO), polysulphide, thermoplastic elastomers involving natural, synthetic rubber, butyl rubber, hypalon rubber, EPDM, Neoprene.

Text Books:

1. S. Kobayashi, et. Al. New frontiers in polmersynthesis.
2. J. H. Koo, Polymer nanocomposites-aprocessing, characterization and applications, MacGraw Hill.
3. L. Nicolais, G. Garotenuto, Metal polymer nanocomposites, Wiley Intersceicne.
4. F. Daniels et. al. Experimental physical chemistry, MacGraw Hill.
5. D. L. Nelson, M. M. Cox, Lehninger princliples of biochemistry, W. H. Freeman.
6. G. Odian, principles of polymerization, Wiley. 69
7. C. S. Harper, Handbook of plastics, elastomers,and composites, MacGraw Hill.
8. M. Morron, Rubber Technology, Kluwer.
9. E. W. Madge, Latex foam rubber, Maclaren and Sons.

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10. R. W. Dyson, Speciality Polymers, Chapman Hall.
11. A. F. Diar, K. Kanazawa, J. I. Castillo and J. A. Logan, Conducting polymers, Plenum

Reference Books:

1. F. Rodriguez, rinciples of polymer systems, MacGraw Hill.
2. H. G. Elias, Macromolecules, Plenum.
3. P. J. Florey, Principles of polymer chemistry, Cornell Univ.
4. F. A. Bovey, Polymer configuration and conformations, Academic.
5. R. J. Young, Introduction to polymer science, Wiley.
6. G. Odian, Principles of polymerization, Wiley.
7. F. W. Billmayer, Text book of polymer science, Wiley.
8. K. K. Chawla, Composite materials, Springer

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