



॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

creating an enlightened society...

UNIVERSITY OFFICE

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CURRICULUM FOR

“MASTER OF SCIENCE (ORGANIC CHEMISTRY)”

M.Sc. (Organic Chemistry)

SEM – 1

SEM – 2

w.e.f. Academic Year 2026-27

Constituent Institute:
Shree Ramkrishna Institute of
Computer Education and Applied
Sciences (SRKI)



Course Curriculum

MASTER OF SCIENCE (ORGANIC CHEMISRTY) Sem-1 and 2

The Course Curriculum of Master of Science (Organic Chemistry) was proposed and drafted by **Academic and Curriculum Committee of Chemistry** under the Faculty of Science in the meeting held on **02-07-2026** and recommended to 'BOARD OF STUDIES' for approval.

Dr. Chaulami Desai
Chairman, Academic
& Curriculum Committee
Science

Place of the meeting
Sarvajani University Office


Sign

The proposed Course Curriculum was approved by **Board of Studies; Science** under the Faculty of Science in the meeting held on **21-08-2026** and was recommended to the 'FACULTY' for approval.

Dr. Jay Bergi
Chairman,
Board of Studies- Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the **Faculty of Science** in the meeting held on **21-08-2026** and was recommended to 'ACADEMIC COUNCIL' for approval.

Dr. Jay Bergi
Chairman &
Dean, Faculty of
Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the '**Academic Council of Sarvajani University**' in the meeting held on **16-09-2026**.

Mr. Ashish Desai
Member Secretary,
Academic Council
& I/c. Registrar,
Sarvajani University

Place of the meeting
Sarvajani University Office


Sign

- The approved curriculum of Master of Science (Organic Chemistry) is with effect from the Academic year **2026-27**



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Organic Chemistry) Sem-I and II



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Faculty of Science

M. Sc. (Organic Chemistry)

DETAILED CURRICULUM
(W.E.F. 2026-27)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Organic Chemistry) Sem-I and II

Credit Framework for 2 Years Postgraduate Program (As per KCG SOP) wef 2026-27
Faculty of Science, Sarvajanic University

Semester	DSC						DSE		Skill Enhancement		Total Credits
	DSC No. of Papers	Theory		Lab		Total DSC Credits					
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits		No. of Papers	Credits	No. of Papers	Credits	
1	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
2	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
3	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
4	Dissrt.			48	16	16	1	4	1	2	22
Total after 2yrs	12 + 1					64	4	16	4	8	88



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FACULTY OF SCIENCE
Master of Science (Organic Chemistry) Sem-I and II

Teaching Scheme for M.Sc. (Organic Chemistry) Semester – I to II						
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
I	Discipline Specific Core-1	4	3	45	2	30
	Discipline Specific Core-2	4	3	45	2	30
	Discipline Specific Core-3	4	3	45	2	30
	Discipline Specific Core-4	4	3	45	2	30
	Discipline Specific Elective-1	4	3	45	2	30
	Skill Enhancement Courses-1	2	2	30	-	-
	Total	22	17	255	10	150
II	Discipline Specific Core-5	4	3	45	2	30
	Discipline Specific Core-6	4	3	45	2	30
	Discipline Specific Core-7	4	3	45	2	30
	Discipline Specific Core-8	4	3	45	2	30
	Discipline Specific Elective-2	4	3	45	2	30
	Skill Enhancement Courses-2	2	2	30	-	-
	Total	22	17	255	10	150



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FACULTY OF SCIENCE
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Evaluation Scheme for M.Sc. (Organic Chemistry) Semester – I to II							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
I	Discipline Specific Core-1	30	10	10	50	50	100
	Discipline Specific Core-2	30	10	10	50	50	100
	Discipline Specific Core-3	30	10	10	50	50	100
	Discipline Specific Core-4	30	10	10	50	50	100
	Discipline Specific Elective-1	30	10	10	50	50	100
	Skill Enhancement Courses-1	15	5	5	25	25	50
II	Discipline Specific Core-5	30	10	10	50	50	100
	Discipline Specific Core-6	30	10	10	50	50	100
	Discipline Specific Core-7	30	10	10	50	50	100
	Discipline Specific Core-8	30	10	10	50	50	100
	Discipline Specific Elective-2	30	10	10	50	50	100
	Skill Enhancement Courses-2	15	5	5	25	25	50



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Faculty of Science
M. Sc. (Organic Chemistry)
SEM – 1

DETAILED CURRICULUM
(W.E.F. 2026-27)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Organic Chemistry) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21101	Course Name	DSC-I: Chemistry of Drugs and Dyes (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	The main purpose of the Chemistry of Drugs and Dyes theory course is to provide and equip students with comprehensive knowledge about the chemistry, preparation, properties, and applications of medicinal drugs and dyes used in daily life and industries.
Course Objective	- To introduce the basic concepts, nomenclature, classification, and important terminology related to drugs and dyes. - To develop an understanding of the chemistry, mode of action, and therapeutic importance of various pharmaceutical compounds. - To study the methods of synthesis, structural aspects, and preparation of important drug intermediates, pharmaceuticals, and dyes. - To provide knowledge of different classes of dyes, their chemical constitution, properties, and industrial applications. - To understand the relationship between chemical structure and the activity/properties of drugs and dyes.
Pre-requisite	Students should have basic knowledge of: - General organic chemistry - Basic physical chemistry - Fundamentals of biochemistry - Basic knowledge of industrial chemistry. - Laboratory skills A foundational understanding of chemistry subjects will help students better understand drug action, dye chemistry, synthesis, and industrial applications.
Course Out come	After successful completion of this course, students will be able to: CO1: Explain the fundamental concepts of drugs, their classification, pharmacological terms, drug-receptor interactions, and routes of drug administration.



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	• CO2: Describe the chemistry, mechanism of action, therapeutic applications, and synthesis of important analgesic, antipyretic, and anti-inflammatory drugs. • CO3: Classify antibiotics and antiviral drugs, explain their sources, structures, therapeutic uses, mechanisms of action, and syntheses of selected pharmaceutical compounds. • CO4: Analyze the principles of dye chemistry, dye-fiber interactions, dyeing mechanisms, and various industrial dyeing processes. • CO5: Interpret the relationship between color and chemical constitution of dyes and evaluate different theories of color and dye behavior. • CO6: Explain the extraction, standardization, medicinal properties, and application of natural dyes, including their adaptation to continuous dyeing processes.
Course Content	Unit-1: General introduction to drugs [07 Hrs] 1.1 Definition of a drug, sources of drugs, requirements of an ideal drug, classification of drugs (based on therapeutic action) with name and structures of two important drugs in each 1.2 Definition of the medicinal terms: Pharmacokinetics, Pharmacodynamics, Pharmacophore, Prodrug, Half-life, bioavailability, LD₅₀, ED₅₀, GI₅₀. Therapeutic index. 1.3 Brief idea of the important terms: Receptors, Agonists, Antagonists, Drug-receptor interaction, Drug potency, Bioavailability, Drug toxicity, Drug addiction, Spurious drugs, Misbranded drugs, Adulterated drugs, Pharmacopoeia. 1.4 Routes of drug administration with advantages and disadvantages Unit-2: Analgesics, antipyretics and anti-inflammatory drugs [07 Hrs] 2.1 Analgesics and antipyretics 2.1.1 Opioids 2.1.2 Non-alkaloid opioids 2.1.3 Opioid peptides 2.1.4 Salicylic acid analogues 2.1.5 Aniline and p-aminophenol derivatives 2.2 Anti-inflammatory drugs 2.2.1 Mechanism of inflammation and various inflammatory conditions 2.2.2 Steroids: Prednisolone, Betamethasone 2.2.3 Sodium Diclofenac, Aceclofenac (N-Aryl anthranilic acids) (Synthesis from 2,6-dichlorodiphenyl amine) Unit-3: Antibiotics and antivirals [07 Hrs] 3.1 Definition and classification with example of each group 3.2 History of discovery of penicillin and structural variations in penicillin 3.2 Broad spectrum antibiotics and their therapeutic uses 3.3 Sources, structural formula and therapeutic uses of 3.3.1 Streptomycin 3.3.2 Tetracycline and Cycloseries 3.3.3 Chloramphenicol and some recent antibiotics 3.3.4 Levofloxacin (Quinolones) (Synthesis from 2,3,4-trifluoro-1-nitrobenzene) 3.4 Aciclovir/Valacyclovir (Purines) with mechanism of action Unit-4: Introduction to dye chemistry and dyeing process [10 Hrs] 4.1 Definition, requirement of an ideal dyes (colour, solubility, linearity, co-planarity, fastness) 4.2 Classification of dyes and fibers 4.3 Intermolecular forces related to dyeing, dye-fiber bonds, adsorption at surfaces



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	4.4 Mechanism of direct, reactive, acid, disperse and other dyes on specific fibers 4.5 Basic operation in dyeing process 4.6 Methods of dyeing Unit-5: Colour and constitution of dyes [07 Hrs] 5.1 Study of Bathochromic, Hypsochromic, Hypochromic and hyperchromic effect 5.2 Colour and chemical constitution 5.2.1 Definition of colour, colour and wavelength of radiation 5.2.2 Colour absorbed and colour visualized with respect to wavelength region. 5.2.3 Relation between colour and chemical constitution 5.3 Armstrong theory and US limitation 5.4 Witt's theory 5.5 Action of Light on dyes and dyed fibers Unit-6: Natural dyes [07 Hrs] 6.1 Medicinal properties of natural dyes 6.2 Basics of natural dyeing 6.3 Methods of extraction of natural dyes 6.4 Standardization of natural dyes 6.5 Continuous dyeing and its adaptation for natural dyeing
Practical	-
Reference Books	• Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4th edition. • Burger's Medicinal Chemistry, Drug Discovery & Development. Abraham & Rotella. Wiley. • Medicinal chemistry. V.K. Ahluwalia and Madhu Chopra, CRC Press. • Drugs V.K. Ahluwalia New Age International Pvt. Ltd Publisher • Principle of medicinal chemistry. Vol 1 & 2 S. S. Kadam, K. R. Mahadik, K. G. Bothara • Chemistry of Synthetic Dyes and Pigments, Lubs H. A., Robert E, 1977, Krieger Publishing company • Chemistry of Synthetic Dyes – Vol I, Venkataraman, K., 1952, Academic Press • Chemistry of Synthetic Dyes – Vol III, Venkataraman, K., 1952, Academic Press • Colour and Chemical Constitution of Organic Dyes, Griffiths J., 1976, Academic Press • Color Chemistry –Synthesis, Properties and Applications of Dyes and Pigments, Zollinger H., 2nd ed., 1991, Weinheim – VCH • Synthetic organic chemistry, O.P. Agrawal, 2014, Krishan Prakashan • Chemistry of dyes & Principles of dyeing Vol II, V. A. Shehai, 1983, Sevak Publications • Chemistry of synthetic dyes, I. G. Vashi • Chemistry of dyes and pigments, K. M. Shah, 2013, Edu. Tech Publishing • Synthetic dyes, G. R. Chatwal, 2009, Himalaya Publishing House



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Master of Science (Organic Chemistry) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21102	Course Name	DSC-I: Chemistry of Drugs and Dyes (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	The main purpose of this course is to develop laboratory skills for the identification, analysis, extraction, separation, and quality control of pharmaceutical substances and dyes.
Course Objective	• To identify important functional groups, present in drugs • To develop quantitative analytical skills • To learn separation and purification techniques • To gain experience in extraction methods • To develop laboratory competence
Prerequisite	Students should have basic knowledge of: • General chemistry, organic chemistry, analytical chemistry, and fundamental laboratory techniques, including titration, solution preparation, chromatography, and safe chemical handling.
Course Out come	After completing this course, students should be able to: • Identify functional groups in pharmaceutical compounds. • Perform pharmaceutical assays. • Use chromatography and extraction techniques effectively.
Course Content	-
Practical	Any three 1. Identification of functional groups in aspirin, paracetamol, sulphanilamide 2. Estimation of Ibuprofen (back titration method) 3. Estimation of Acid neutralizing capacity of a drug. 4. Separation of components of natural pigments by paper chromatography (e.g., chlorophylls) 5. Extraction of curcumin from turmeric powder 6. TLC of a mixture of dyes (safranin-T, Indigo carmine, methylene blue) 7. Industrial visit Report (Pharmaceutical/Dye)
Reference Books	• Practical organic chemistry – A. I. Vogel • Practical organic chemistry – H. Middleton. • Practical organic chemistry – O.P. Aggarwal.



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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21103	Course Name	DSC-II: Chemistry of Natural Products (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	This course aims to develop an advanced understanding of the chemistry, structural elucidation, biological significance, and pharmaceutical applications of natural products, while introducing modern analytical techniques, drug discovery approaches, and green chemistry practices in natural product research.
Course Objective	- To understand the chemistry and classification of major natural products. - To learn the isolation, purification, and structural elucidation of natural compounds. - To study the biological and medicinal importance of natural products. - To understand the structure and functions of nucleic acids. - To explore modern techniques, drug discovery applications, and green chemistry approaches in natural product research.
Pre-requisite	Students should have: Basic knowledge of organic chemistry and reaction mechanisms. Understanding of stereochemistry and structural chemistry. Familiarity with biomolecules and natural products at the undergraduate level. Basic knowledge of spectroscopic techniques. Fundamental understanding of biochemistry and medicinal chemistry concepts.
Course Out come	At the end of the course, students will be able to: CO1: Explain the classification, occurrence, chemistry, and medicinal significance of major classes of natural products. CO2: Apply isolation, purification, and structural elucidation methods for natural products using classical and spectroscopic techniques. CO3: Analyze the structure, chemistry, and biological functions of alkaloids, terpenoids, glycosides, flavonoids, steroids, and nucleic acids.



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	• CO4: Interpret the structure and functions of DNA, RNA, nucleotides, and their role in biological processes. • CO5: Evaluate the role of natural products in drug discovery and appreciate recent advances, including marine natural products, microbial metabolites, and green chemistry approaches.
Course Content	Unit:1 Alkaloids (07 Hrs) 1.1 Introduction, occurrence and classification of alkaloids 1.2 Isolation and purification methods 1.3 General methods of structural elucidation 1.4 Chemistry and structure determination of: Reserpine and Morphine 1.5 Medicinal significance and physiological functions Unit:2 Terpenoids (07 Hrs) 2.1 Classification and isolation of terpenoids 2.2 Isoprene rule and biosynthesis of terpenes 2.3 General methods of structure determination 2.4 Structural elucidation of: Citral and Zingiberene 2.5 Biological and medicinal importance Unit:3 Glycosides and Flavonoids (07 Hrs) 3.1 Classification and medicinal importance of glycosides 3.2 Cardiac glycosides and saponins 3.3 Isolation and characterization of flavonoids 3.4 Structural elucidation of quercetin and anthocyanidins 3.5 Biological activities and applications Unit:4 Steroids (08 Hrs) 4.1 Nomenclature and stereochemistry 4.2 Sterols, spectral properties of steroids 4.3 Chemistry of: Cholesterol and ergosterol 4.4 Introduction. Structural elucidation and Synthesis of Cholanic acids (α and β both). 4.5 Biological and medicinal importance Unit:5 Nucleic Acids (06 Hrs) 5.1 Purine and pyrimidine bases of nucleic acids, base pairing via H-bonding 5.2 Structure of ribonucleic acids (RNA) and deoxyribonucleic acids (DNA) 5.3 Double helix model of DNA 5.4 Chemical and enzymatic hydrolysis of nucleic acids 5.5 Overview of replication of DNA, transcription, functions of nucleotides



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	Unit:6 Modern Aspects of Natural Products (10 Hrs) 6.1 Spectroscopic methods in natural product chemistry 6.2 Natural products as lead molecules in drug discovery 6.3 Marine natural products 6.4 Microbial metabolites 6.5 Recent advances in natural products research 6.6 Green chemistry approaches in natural product isolation
Practical	-
Reference Books	• Organic Chemistry, Vol. II. By I.L. Finar • Chemistry of Natural Products by O.P. Agarwal • Natural Products: Their Chemistry and Biological Significance by Mann, Davidson, Hobbs, Banthorpe and Harborne • Chemistry of Natural Products by Krishnaswamy N. R., Universities Press • Organic Chemistry, Natural Products -Vol. 1 by O.P. Agarwal, Krishna Prakashan Media (P) Ltd • Organic Chemistry, Natural Products -Vol. 2: by O.P. Agarwal Krishna Prakashan Media (P) Ltd • Organic Chemistry of Natural Products -Vol. I Revised 4th Edition by Chatwal Gurdeep R. Himalaya Publishing House • Organic Chemistry of Natural Products Vol. 2: Revised 4th Edition by Chatwal Gurdeep R. Himalaya Publishing House • Stereochemistry and the Chemistry Natural Products, 5th Edition by FINAR Pearson Education India • Chemistry of Natural Products, Vol. 1 by Ashutosh Kar CBS • Natural Products: Chemistry and Applications by Sujata V. Bhat, B. A. Nagasampagi, S. Meenakshi, Narosa Publishing House • Natural Products: Chemistry, Biochemistry and Pharmacology by Goutam Brahmachari



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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21104	Course Name	DSC-II: Chemistry of Natural Products (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	This course aims to develop students' practical skills in the extraction, isolation, identification, estimation, and spectroscopic characterization of natural products and biomolecules. It provides hands-on training in qualitative and quantitative analytical techniques, promotes the application of green and sustainable extraction methods, and enhances competency in modern laboratory practices.
Course Objective	- To understand and perform the extraction, isolation, and estimation of natural products - To apply qualitative and quantitative analytical methods for the identification and characterization - To develop proficiency in spectroscopic techniques, particularly UV-Visible and IR spectroscopy, for the analysis and structural elucidation of natural compounds. - To strengthen laboratory skills, including experimental design, data interpretation, scientific documentation, and safe laboratory practices, to prepare for research and industrial applications.
Prerequisite	Students should have a basic understanding of organic and analytical chemistry, fundamental laboratory techniques, spectroscopy, and laboratory safety practices.
Course Out come	At the successful completion of this course, students will be able to: CO1. Perform the extraction, isolation, and estimation of natural products and biomolecules using standard laboratory techniques. CO2. Apply qualitative and quantitative analytical methods for the identification and characterization of natural compounds. CO3. Analyze and interpret UV-Visible and IR spectroscopic data for the structural elucidation of natural products. CO4. Demonstrate the use of green extraction techniques and adopt safe, sustainable laboratory practices.



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	CO5. Record, interpret, and communicate experimental results effectively, preparing them for research, quality control, and industrial laboratory applications.
Course Content	-
Practical	Any three 1. Determination of Total Flavonoid Content 2. Qualitative detection of alkaloids (Three test) 3. Qualitative Analysis of DNA and Estimation Using UV Spectroscopy 4. Extraction of citral and its quantitative estimation 5. Isolation and Estimation of Cholesterol from Egg Yolk (With and without acetic anhydride) 6. Interpretation of UV–Visible, IR of selected natural products for structural elucidation. 7. Green Extraction of Bioactive Compounds Using Ultrasound-Assisted Extraction (UAE)
Reference Books	• Instrumental Methods of Chemical Analysis – Himalaya Publishing House. • Spectroscopy – Pragati Prakashan. • Organic Spectroscopy – Narosa Publishing House. • Analytical Biochemistry – Narosa Publishing House. • Experiments in Biochemistry – Narosa Publishing House.



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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21105	Course Name	DSC-III: Polymer Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75
Purpose of Course		To provide fundamental and applied knowledge of polymer chemistry and its industrial applications.				
Course Objective		1.To understand classification and structure of polymers. 2. To study polymerization mechanisms and techniques. 3.To understand industrial applications and characterization of polymers. 4.To perform basic polymer synthesis and instrumental analysis.				
Pre-requisite		Basic knowledge of Organic Chemistry, Physical Chemistry, Analytical Techniques and basic material science.				
Course Outcome		CO1: Understand basic concepts of polymers. CO2: Explain polymerization reactions and techniques. CO3: Correlate structure and properties of polymers. CO4: Perform synthesis and analysis of polymers in laboratory.				
Course Content		Unit-1: Introduction to Polymers [07 Hrs] 1.1 Introduction, nomenclature and classification of polymers 1.2 Thermoplastics and thermosetting polymers 1.3 Molecular weight and degree of polymerization 1.4 Glass transition temperature (Tg), Melting temperature (Tm) Unit-2: Polymerization Reactions and Mechanisms [08 Hrs] 1.1 Addition and condensation polymerization 1.2 Free radical polymerization 1.3 Ionic polymerization 1.4 Polymerization techniques Unit-3: Structure and Properties of Polymers [08 Hrs] 3.1 Structure and properties of polymers 3.2 Crystalline and amorphous polymers 3.3 Thermal, mechanical 3.4 Electrical properties				



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	Unit-4: Industrially Important Polymers [07 Hrs] 4.1 Importance of industrial polymers 4.2 Polyethylene 4.3 Polypropylene 4.4 PVC 4.5 Nylon 4.6 Bakelite 4.7 Epoxy and biodegradable polymer Unit-5: Polymer Processing and Characterization [07 Hrs] 5.1 Polymer additives and fillers 5.2 Plasticizers and stabilizers 5.3 Inject and Compression molding 5.4 Extrusion 5.5 Viscosity measurements and molecular weight determination 5.6 Thermal analysis 5.7 Spectroscopic methods Unit-6: Applications and Recent Developments in Polymer Chemistry [08 Hrs] 6.1 Conducting polymers 6.2 Biomedical polymers 6.3 Recycling of plastics 6.4 Green polymers and recent developments.
Practical	-
Reference Books	• Polymer Science – V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, New Age International Publishers, New Delhi • Polymer Chemistry – P. Bahadur and N. V. Sastry, Narosa Publishing House, New Delhi • A Textbook of Polymer Chemistry – M. S. Bhatnagar, S. Chand Publishing, New Delhi • Polymer Science and Technology – Joel R. Fried (Indian Edition), PHI Learning / Pearson India • Introduction to Polymer Science – G. S. Misra, New Age International Publishers, New Delhi • Practicals in Polymer Science: Synthesis and Qualitative & Quantitative Analysis of Macromolecules, Siddaramaiah, CBS Publishers & Distributors, New Delhi • Advanced Practical Physical Chemistry, J. B. Yadav, Goel Publishing House, Meerut • Experimental in Polymer Science, D.G.Hundiware, V.D.Athawale, U.R.Kapdi and V.V.Gite, International Publishers, New Delhi • Practical Physical Chemistry, B. Viswanathan and P. S. Raghavan, Viva Books / Narosa Publishing



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Master of Science (Organic Chemistry) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21106	Course Name	DSC-III: Polymer Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To provide practical exposure to synthesis and characterization of polymers.
Course Objective	- To synthesize simple polymers using easily available chemicals. - To perform instrumental analysis of polymer solutions - To understand basic polymer laboratory techniques.
Prerequisite	Basic laboratory knowledge of chemistry.
Course Out come	Students will be able to synthesize and analyze simple polymer systems.
Course Content	Laboratory course based on synthesis and instrumental analysis of polymers.
Practical	Any three 1. Preparation of Slime (Poly Vinyl Alcohol Hydrogel) 2. Preparation of Urea Formaldehyde Resin. 3. Determination of viscosity of polymer solution using Ostwald viscometer. 4. Determination of pH and conductivity of polymer solution.
Reference Books	- Practicals in Polymer Science: Synthesis and Qualitative & Quantitative Analysis of Macromolecules, Siddaramaiah, CBS Publishers & Distributors, New Delhi - Advanced Practical Physical Chemistry, J. B. Yadav, Goel Publishing House, Meerut - Experimental in Polymer Science, D.G. Hundiware, V.D. Athawale, U.R. Kapdi and V.V. Gite, International Publishers, New Delhi - Practical Physical Chemistry, B. Viswanathan and P. S. Raghavan, Viva Books / Narosa Publishing



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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21107	Course Name	DSC-IV: Inorganic Chemistry-III (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	The systematic understanding of inorganic chemistry of elements and their compounds, emphasizing both theoretical principles and practical applications.
Course Objective	- To understand how ligand fields influence the electronic structure, color, and magnetism of transition metal complexes. - To study the role of metal ions in biological systems and their applications in medicine and enzymatic activity. - To analyze mechanisms, stability, and isomerism in coordination complexes with emphasis on catalysis. - To explore bonding and reactivity in clusters and organometallic compounds, highlighting industrial uses. - To train students in classical and instrumental methods for accurate inorganic analysis. - To introduce synthesis, characterization, and applications of advanced materials like nanomaterials, zeolites, and ceramics.
Pre-requisite	Basic knowledge of inorganic chemistry
Course Outcome	After completion of the course, students will be able to: CO1: Apply crystal field and ligand field concepts to predict electronic structure, color, and magnetic properties of transition metal complexes. CO2: Explain the role of metal ions in biological systems and evaluate their applications in medicine and enzymatic functions. CO3: Analyze substitution and electron transfer mechanisms in coordination complexes and their applications in catalysis. CO4: Interpret bonding and stability in clusters and organometallic compounds, and demonstrate their industrial catalytic uses. CO5: Employ classical and instrumental methods to accurately determine composition and trace elements in inorganic samples. CO6: Synthesize and characterize advanced inorganic materials (nanomaterials, zeolites, ceramics) and relate their structure to applications.



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Course Content	Unit-1: Advanced Crystal Field Theory & Ligand Field Theory [08 Hrs] 1.1 Crystal Field Splitting: Octahedral, tetrahedral, square planar geometries; quantitative treatment of Δ_o and Δ_t. 1.2 Jahn–Teller Distortion: Origin, examples in Cu^{2+} complexes, consequences on geometry and reactivity. 1.3 Ligand Field Theory: Combines crystal field with molecular orbital theory; explains co valency in bonding. 1.4 Spectrochemical Series: Order of ligands based on field strength; correlation with electronic spectra. 1.5 Applications: Magnetic properties, electronic spectra, and reactivity of transition metal complexes.
	Unit-2: Bioinorganic Chemistry [07 Hrs] 2.1 Essential Metal Ions: Na^+, K^+, Mg^{2+}, Ca^{2+} in biological regulation. 2.2 Metalloenzymes: Role of Fe in hemoglobin, Mg in chlorophyll, Zn in carbonic anhydrase. 2.3 Metal Toxicity & Chelation: Lead, mercury poisoning; EDTA therapy. 2.4 Oxygen Transport & Storage: Hemoglobin vs. myoglobin, cooperative binding. 2.5 Electron Transfer Proteins: Cytochromes, iron–sulfur clusters. 2.6 Medicinal Applications: Cisplatin in cancer therapy, MRI contrast agents (Gd^{3+} complexes).
	Unit-3: Advanced Coordination Chemistry-II [07 Hrs] 3.1 Reaction Mechanisms: Substitution (associative, dissociative, interchange), electron transfer (inner vs. outer sphere). 3.2 Kinetics & Thermodynamics: Factors influencing stability and reactivity. 3.3 Chelate Effect: Thermodynamic basis, applications in analytical chemistry. 3.4 Isomerism: Structural, stereoisomerism, linkage isomerism. 3.5 Applications: Catalysis, analytical reagents, biological systems.
	Unit-4: Cluster and Organometallic Chemistry-II [08 Hrs] 4.1 Metal–Metal Bonding: Quadruple bonds, $\text{Re}_2\text{Cl}_8^{2-}$. 4.2 Carbonyl Clusters: Structure, electron counting (Wade’s rules, 18-electron rule). 4.3 Boranes & Carboranes: Structures, bonding, applications. 4.4 Catalysis: Homogeneous catalysis, hydroformylation, olefin metathesis. 4.5 Industrial Relevance: Ziegler–Natta polymerization, Fischer–Tropsch synthesis.
	Unit-5 Analytical Inorganic Chemistry [08 Hrs] 5.1 Classical Methods: Gravimetric, volumetric analysis. 5.2 Instrumental Techniques: Atomic absorption spectroscopy (AAS), inductively coupled plasma mass spectrometry (ICP-MS), X-ray fluorescence (XRF). 5.3 Electroanalytical Methods: Potentiometry, voltammetry. 5.4 Applications: Trace metal analysis, environmental monitoring, clinical diagnostics.



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	Unit-6: Advanced Inorganic Materials [07 Hrs] 6.1 Nanomaterials: Quantum dots, nanoparticles, nanocomposites. 6.2 Zeolites: Structure, ion-exchange, catalysis. 6.3 Ceramics & Glasses: Properties, applications in technology. 6.4 Inorganic Membranes: Gas separation, fuel cells. 6.5 Smart Materials: Shape-memory alloys, piezoelectric materials.
Practical	-
Reference Books	Theory Reference Books • Ligand Field Theory and Its Applications Brian N. Figgis & Michael A. Hitchman (Wiley-VCH) • Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life Wolfgang Kaim & Brigitte Schwederski (Wiley) • Bio-inorganic Chemistry K. Hussain Reddy (New Age International) • Coordination Chemistry (6th Edition) Ajai Kumar (Aaryush Education) • Introduction to Coordination Chemistry Geoffrey A. Lawrance & Paul V. Bernhardt (Wiley) • Organometallics Christoph Elschenbroich (Wiley-VCH) • Organometallic and Bioinorganic Chemistry Ajai Kumar • Analytical Chemistry: Basic Techniques and Methods Priti Malhotra (Springer) • Advanced Instrumental Analysis Kumaraswamy Gandla & M. Jagadeeswaran (2022) • Inorganic Chemistry Catherine Housecroft & Alan Sharpe (Pearson) • Concise Inorganic Chemistry J.D. Lee (Oxford University Press)



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH21108	Course Name	DSC-IV: Inorganic Chemistry-III (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To provide practical knowledge and laboratory skills related to the analysis, quality evaluation.
Course Objective	- To introduce students to spectrophotometric methods for studying transition metal complexes and understanding how ligand strength affects crystal field splitting. - To familiarize students with spectrophotometric techniques for analyzing biomolecular interactions and to demonstrate the principle of cooperative oxygen binding in hemoglobin. - To train students in the synthesis of organometallic compounds and in the use of IR spectroscopy for structural characterization. - To develop skills in classical gravimetric analysis by precipitating and weighing BaSO₄ for accurate estimation of sulfate ions.
Pre-requisite	- Basic knowledge of General Chemistry and Analytical Chemistry. - Familiarity with laboratory glassware and titrimetric techniques. - Understanding of fundamental concepts of spectroscopy.
Course Outcome	Upon successful completion of the practical course, students will be able: CO1: To calculate crystal field splitting energy (Δ_0) and correlate ligand strength with spectral properties of transition metal complexes. CO2: To analyze oxygen binding behavior in hemoglobin and interpret cooperative binding using spectrophotometric data. CO3: To synthesize an organometallic compound and confirm its structure using IR spectroscopy. CO4: To perform gravimetric analysis to estimate sulfate ions accurately by precipitation and weighing of BaSO₄.
Course Content	



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Practical	Any three 1. To Determine Δ_o values for $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Ni}(\text{NH}_3)_6]^{2+}$ pectrophotometrically. 2. To Study cooperative binding of O_2 through spectrophotometer. 3. To Prepare and characterize ferrocene through IR spectrometer. 4. Gravimetric determination of sulfate as BaSO_4 from BaCl_2.
Reference Books	Practical Reference Books • Figgis & Hitchman, Ligand Field Theory and Its Applications • K. Hussain Reddy, Bioinorganic Chemistry • Christoph Elschenbroich, Organometallics • Priti Malhotra, Analytical Chemistry: Basic Techniques and Methods.



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH22101	Course Name	DSE-I: Industrial Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	This course is designed to provide students with a comprehensive understanding of industrial chemical processes, unit operations, quality systems, and modern manufacturing technologies.
Course Objective	- To explain the role of modern technologies such as flow chemistry and phase transfer catalysis in industrial synthesis. - To educate students with concepts of quality control, quality assurance, GLP, GMP, ISO standards, and Six Sigma in chemical and pharmaceutical industries. - To develop an understanding of industrial equipment, process optimization, and manufacturing practices used in chemical industries.
Pre-requisite	Students should have a basic understanding of organic, inorganic, physical, and analytical chemistry, along with fundamental concepts of chemical reactions and laboratory techniques.
Course Out come	Upon successful completion of this course, students will be able to: CO1: Explain the principles of unit processes, unit operations, and chemical reactions employed in industrial manufacturing. CO2: Apply the concepts of flow chemistry and phase transfer catalysis for efficient and sustainable chemical synthesis. CO3: Demonstrate knowledge of industrial equipment, process technologies, and their applications in chemical industries. CO4: Evaluate and implement quality control, quality assurance, GLP, GMP, ISO standards, and Six Sigma practices in chemical and pharmaceutical industries. CO5: Analyze industrial chemical processes with respect to product quality, process efficiency, safety, and regulatory compliance. CO6: Develop problem-solving skills and technical competence required for employment and research in the chemical, pharmaceutical, petrochemical, and allied process industries



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Course Content	Unit-1: Unit Processes and Chemical Reactions in Organic Chemistry (10 Hrs) 1.1 Introduction of unit processes 1.2 Various unit processes: Nitration, Halogenation, Sulphonation, Oxidation, Hydrogenation Cyanation, Formylation, Polymerization 1.3 Aerobic and anaerobic fermentation: Production of ethyl alcohol and citric acid, antibiotics, amino acids, vitamin B2, Vitamin B12 and Vitamin C 1.4 Important chemical reaction and their applications in chemical process industries
	Unit-2: Unit Operations (08 Hrs) 2.1 Principle and method of distillation, solvent extraction, solid-liquid leaching, liquid - liquid extraction, membrane processes, absorption, adsorption, crystallization process 2.2 Physical techniques in chemical industries: filtration, centrifugation, drying 2.3 Equipment needed in chemical technology: reactors, distillation columns, extruders, pumps, mills, emulsifiers
	Unit-3: Flow Chemistry (06 Hrs) 3.1 Introduction 3.2 Flow chemistry versus batch chemistry 3.3 Key principles of flow chemistry: residence time, mixing, pressure and temperature 3.4 Types of flow chemistry
	Unit-4: Quality Control & Assurance in Chemical industry (08 Hrs) 4.1 Statistical treatment of data 4.2 Control charts 4.3 Performance evaluation uncertainties in measurement 4.4 Validation of analytical methods, instrumentation, persons 4.5 Elements of quality assurance 4.6 Quality management concepts and principles 4.7 Quality Management System: ISO 9001:2016
	Unit-5: TQM in Chemical Industry (08 Hrs) 5.1 Six sigma approach to Quality 5.2 Applying six sigma to chemical Industries 5.3 Good Laboratory Practices: principles of GLP 5.4 GMP in drugs & pharmaceutical Industries 5.5 Accreditation of QC laboratories 5.6 Tools and mechanisms ICH guidelines on drug substances and products
	Unit-6: Phase Transfer Catalysis (05 Hrs) 6.1 Nature of phase transfer catalysis reactions 6.2 Factors affecting phase transfer catalysis reactions 6.3 Choosing a phase transfer catalyst 6.4 Important phase transfer catalysts 6.5 Importance of homogenous catalysis in synthesis of high value chemicals
	Practical -



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Reference Books	• P. G. More, Comprehensive Industrial Chemistry, Pragati Edition, Meerut, 2010.2. • P. H. Groggins, Unit Processes in Organic Synthesis- Tata McGrawHill, 5th Edition, New Delhi, 2010. • M. Gopal Rao, Dryden's Outline of Chemical Technology, Marshall Sittig, East-West Press, 3rd Edition, 2014 • Industrial chemistry, H.K. L. Vaid, 1st Edition, 2007, Anmol publication. • Outlines of industrial chemistry, Frank Hall Thorp and Warren Kendall Lewis, 2018, Palala Press. • Industrial Chemistry, Dr. Darshan V. Chaudhary, 1st Edition, 2015, Create space publisher. • Industrial Inorganic Chemistry, Mark Anthony Benvenuto, de Gruyter, 2013. • Toma Glasnov, Continuous-Flow Chemistry in Research Laboratory, Springer International Publisher. • The chemistry of process development in fine chemicals and pharmaceutical industry, C. Someshwara Rao, 2nd Edition, 2004, Asian books Pvt. Ltd. New Delhi • Developing an Industrial chemical process, Joseph Mizrahi, 2003, CRC press • Designing and operating safe chemical reaction process, Health and Safety Executive (HSE), 2000, HSE publishers
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Faculty	Science		Program		M.Sc. Organic Chemistry	
Year	2026		Version		2.0	
Semester	I		Effective From		June, 2026	
Course Code	MSCH22102	Course Name	DSE-I: Industrial Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	This practical course equips students with hands-on skills in industrial chemistry, organic synthesis, fermentation, separation, and quality assurance. It builds the technical and analytical expertise required to operate effectively in chemical and pharmaceutical laboratory environments.
Course Objective	• To develop practical skills in industrial chemistry techniques and organic synthesis. • To provide hands-on training in separation, purification, and fermentation processes. • To familiarize students with quality control, GLP, and industrial laboratory practices. • To enhance analytical, technical, and problem-solving skills for industrial and research applications.
Prerequisite	Students should possess basic knowledge of organic, physical, and analytical chemistry, laboratory techniques, and safe handling of chemicals and laboratory equipment.
Course Out come	• CO1: To provide hands-on training in fundamental industrial chemistry techniques such as distillation, crystallization, fermentation, and organic synthesis. • CO2: To develop practical skills in the synthesis, purification, and characterization of industrially important organic compounds. • CO3: To familiarize students with industrial quality management practices, including Good Laboratory Practices (GLP), laboratory documentation, and quality assurance. • CO4: To enhance students' ability to evaluate experimental data, determine product quality, and assess process efficiency using appropriate analytical methods. • CO5: To develop problem-solving, critical thinking, and technical competencies through laboratory experiments and industrial case studies.



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	• CO6: To prepare students for research and professional careers in chemical, pharmaceutical, and allied process industries by integrating theoretical knowledge with practical applications.
Course Content	---
Practical	Any three • Separation of acetone–water mixture by simple and fractional distillation • Crystallization of benzoic acid from water and determination of percentage recovery • Fermentation of glucose to ethanol using yeast and estimation of alcohol • Case study on Six Sigma application in a chemical manufacturing process • Synthesis of p-Bromoacetanilide • Synthesis of aspirin followed by purity assessment • Internal laboratory audit using GLP checklist
Reference Books	• P. G. More – <i>Comprehensive Industrial Chemistry</i>. • H. K. L. Vaid – <i>Industrial Chemistry</i>. • M. Gopal Rao – <i>Dryden's Outline of Chemical Technology</i>. • V. K. Ahluwalia & Renu Aggarwal – <i>Comprehensive Practical Organic Chemistry</i>. • V. K. Ahluwalia & Sunita Dhingra – <i>Laboratory Manual of Organic Chemistry</i>. • B. K. Sharma – <i>Industrial Chemistry</i>.



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	I		Effective From	June, 2026		
Course Code	MSCH23101	Course Name	SEC: Research Methodology-I (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
2	2	-	-	25	25	50
Purpose of Course		This course aims to develop students' understanding of the principles and practices of scientific research.				
Course Objective		- To understand the concepts, objectives, scope, and types of scientific research. - To develop skills in identifying research problems and formulating hypotheses. - To familiarize students with scientific literature, reference management, and laboratory practices. - To learn methods of data collection, statistical analysis, and scientific communication. - To understand research ethics, intellectual property rights, and recent advances in chemical research.				
Pre-requisite		Students should have: - Basic knowledge of chemistry and scientific methods. - Familiarity with documentation process. - Fundamental knowledge of computer applications and internet resources for scientific information.				
Course Out come		At the end of the course, students will be able to: CO1: Explain the concepts, objectives, types, and methodology of scientific research. CO2: Apply literature survey techniques, formulate research problems, and design scientific experiments. CO3: Analyze experimental data using statistical methods and software tools for scientific interpretation. CO4: Prepare scientific reports, research papers, posters, and presentations using appropriate citation styles. CO5: Demonstrate ethical research practices, understand Intellectual Property				



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	Rights, and appreciate emerging trends in chemical research.
Course Content	Unit-1: Fundamentals of Research Methodology (08 Hrs) 1.1 Meaning, objectives, scope, and significance of research 1.2 Types of research: Basic, Applied, Experimental, Analytical, Interdisciplinary 1.3 Research process and scientific method 1.4 Identification and formulation of research problems 1.5 Research objectives and hypothesis 1.6 Variables, research design, and experimental planning Unit-2: Literature Survey, Experimental Design and Lab. Practices (08 Hrs) 2.1 Sources of scientific literature: Journals, books, patents, conference proceedings, and online databases 2.2 Literature search using Google Scholar, Scopus, Web of Science, SciFinder 2.3 Reference management software: Mendeley, Zotero, and EndNote 2.4 Experimental design and sampling methods 2.5 Good Laboratory Practices (GLP) 2.6 Laboratory safety, chemical handling, risk assessment, calibration, QA/QC Unit-3: Data Analysis and Scientific Communication (07 Hrs) 3.1 Collection, organization, and presentation of experimental data 3.2 Accuracy, precision, and error analysis 3.3 Descriptive statistics: Mean, median, mode, standard deviation, and variance 3.4 Regression, correlation, and hypothesis testing 3.5 Use of MS Excel and Origin for data analysis 3.6 Scientific writing: Research papers, dissertations, abstracts, posters, and oral presentations 3.7 Citation styles and reference management 3.8 Peer-review and publication process Unit-4: Research Ethics, IPR and Emerging Trends (07 Hrs) 4.1 Research ethics and responsible conduct of research 4.2 Plagiarism, fabrication, falsification, and publication ethics 4.3 Authorship, copyright, and data integrity 4.4 Intellectual Property Rights (IPR): Patents, trademarks, copyrights, and patent filing 4.5 Green chemistry and sustainable research 4.6 Nanotechnology, computational chemistry, artificial intelligence in chemistry 4.7 Current trends and future perspectives in chemical research
Practical	-
Reference Books	• C. R. Kothari, Research Methodology: Methods and Techniques. • Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners. • Wayne C. Booth, Gregory G. Colomb & Joseph M. Williams, The Craft of Research. • Day, R. A. & Gastel, B., How to Write and Publish a Scientific Paper. • Montgomery, D. C., Design and Analysis of Experiments.



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| | <ul style="list-style-type: none">• Miller, J. N. & Miller, J. C., Statistics and Chemometrics for Analytical Chemistry.• ICH Guidelines on Good Laboratory Practices (GLP).• WIPO publications on Intellectual Property Rights.• ACS Style Guide for Scientific Writing. |
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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21201	Course Name	DSC-V: Organic Synthesis and Mechanism (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	To develop a thorough understanding of advanced organic reaction mechanisms, stereochemistry, aromaticity, and oxidation–reduction reactions, enabling students to analyze and apply these concepts in organic synthesis and research.
Course Objective	- To understand advanced organic reaction mechanisms and rearrangements. - To study methods for determining reaction mechanisms and isotope effects. - To explain oxidation and reduction reactions in organic chemistry. - To understand the Hammett equation and aromaticity concepts. - To develop knowledge of stereochemistry and its applications.
Pre-requisite	Basic knowledge of organic chemistry, reaction mechanisms, chemical bonding, stereochemistry, and fundamental concepts of physical chemistry.
Course Out come	After successful completion of this course, students will be able to: CO1: Explain advanced organic reaction mechanisms and rearrangement reactions. CO2: Analyze reaction mechanisms using kinetic, stereochemical, and isotopic evidence. CO3: Apply oxidation and reduction methods in organic synthesis. CO4: Interpret the Hammett equation and concepts of aromaticity. CO5: Explain stereochemistry and predict the behavior of stereoisomers in organic reactions.
Course Content	Unit-1: Rearrangement/Reaction (10 Hrs) 1.1 Rearrangement to electron deficient carbon: Pinacol-pinacolone, Wagner - Meerwein. Benzillic acid, Wolf Arndt-Eisterts synthesis 1.2 Rearrangement to electron deficient Nitrogen: Hofmann, Curtius, Schmidt, 1.3 Rearrangement to electron deficient Oxygen: Baeyer Villiger 1.4 Rearrangement to electron rich carbon: Favorskii, Witting 1.5 Aromatic rearrangements: Fries, Claisen and Benzidine free radical 1.6 Dakin reaction 1.7 Reformatsky reaction



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	1.8 Cannizzaro reaction 1.9 Dieckmann reaction, 1.10 Perkin reaction Unit-2: Methods of Determining Mechanisms and Isotope Effects (05 Hrs) 2.1 Introduction 2.2 Methods of determining mechanism 2.2.1 Determination of the products formed 2.2.2 Study of intermediate formed 2.2.3 Study of catalyst 2.2.4 Stereochemical Evidence 2.2.5 Kinetic Evidence 2.2.6 Isotope Labelling 2.3 Isotopic Effects Unit-3: Oxidation and Reduction (10 Hrs) 3.1 Oxidation of alcohol: Chromic acid, Chromium (VI)oxide, pyridine complexes, Manganese (IV)oxide and silver carbonate 3.2 Oxidation of ketones; conversion into unsaturated ketones, oxidation of ketols 3.3 Oxidation with ruthenium tetroxide, Oxidation with thallium(III)nitrate, 3.4 Oppenauer oxidation 3.5 Catalytic hydrogenation, selectivity of reaction of functional groups, 3.6 Homogeneous hydrogenation, 3.7 Reduction by dissolving metals: reduction with metal and acid reduction of carbonyl compounds 3.8 Reduction with Metal in liquid ammonia (Birch reduction) 3.9 Reductive fission of alcohols and halides 3.10 Reduction by hydride transfer reagents: 3.11 Other methods : Wolf Kishner reduction, desulphurization of thioacetals Unit-4: Hammett Equation its modification and applications (08 Hrs) 4.1 Linear free energy relationship 4.2 Hammett equation 4.3 Derivation of Hammett equation 4.4 Physical meaning of σ and ρ 4.5 Significance and modification of ρ 4.6 Applications of Hammett plots 4.7 Deviation from linearity 4.8 Thermodynamic implication of Hammett equation Unit-5: Aromaticity (06 Hrs) 5.1 Aromaticity and Huckel's rule 5.2 Aromaticity in benzenoid and non-benzenoid compounds 5.3 Annulenes, fullerenes 5.4 Alternant and non-alternant hydrocarbons energy level of molecular orbitals 5.5 Anti aromaticity, homo aromaticity, non-aromatic compounds Unit-6: General Stereochemistry (06 Hrs)
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	6.1 Chirality and Fischer projection 6.2 Optical isomerism in biphenyls and allenes 6.3 Concept of Pro-stereoisomerism and Asymmetric synthesis 6.4 Conformation of a few acyclic molecules (alkanes, haloalkanes) 6.5 Conformation of cyclic systems having one and two sp ² carbon atoms.
Practical	-
Reference Books	References: • Mechanism and structure in organic chemistry, E.S. Gould, Holt, Rinehart and Winston. • Advanced organic chemistry, J. March. • Physical organic chemistry, J. Hine. • Advanced organic chemistry Part A-Carey F. A. and Sundberg R. J. (Plenum Press). • Organic Chemistry, Clayden, Greeves, Warren and Wothers [Oxford Press]. • Designing organic synthesis, S. Warren, Willey • Some modern methods of organic synthesis, W. Carrathers, Cambridge Univ. Press • Modern synthetic reaction, H.O. House, W. A. Benjamin. • Advanced organic reactions, reactions, mechanisms and structure, J. March, Wiley. • Principles of organic synthesis, R.O.C. Norman and J. M. Coxon, Blackie Academic and Professional. • Advanced organic chemistry part-B, F, A. Carrey and R. J. Sundberg, Plenum • Organic reaction and their mechanisms, P. S. Kalsi, New Age International Publishers. • Protective groups in organic synthesis, T. W. Greene and P. G. M. Wuts, IInd Edition, John Wiley and Sons 1991. • Organic synthesis: the disconnection approach, Sturant Warren, John Wiley and Sons. • Mechanism and structure in organic chemistry, E.S. Gould, Holt, Rinehart and Winston.



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21202	Course Name	DSC-V: Organic Synthesis and Mechanism (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	Purpose of this course is to teach the students about organic synthesis and reactions as well as to develop the laboratory skills.
Course Objective	- To synthesize organic compounds. - To study important organic reactions. - To develop practical laboratory skills. - To estimate components in organic mixtures accurately.
Prerequisite	Basic knowledge of organic chemistry, understanding of common organic reactions
Course Out come	CO1: Synthesize organic compounds using standard laboratory methods. CO2: Perform important organic reactions safely and accurately. CO3: Purify and characterize synthesized compounds. CO4: Estimate the composition of organic mixtures using quantitative analysis.
Course Content	-
Practical	Any three - Organic synthesis of methyl orange - Preparation of eosin from phthalic acid - Preparation of p-chlorotoluene from p-toluidine - Estimation of mixture (Acid + Amide) - Estimation of mixture (Acid + Ester)
Reference Books	- Vogel's Textbook of Practical Organic Chemistry – A. I. Vogel. - Practical Organic Chemistry – F. G. Mann & B. C. Saunders. - A Textbook of Practical Organic Chemistry – A. I. Vogel. - Practical Organic Chemistry – O. P. Agarwal. - Practical Chemistry – V. K. Ahluwalia & Sunita Dhingra. - Advanced Practical Organic Chemistry – Jagdamba Singh & Jaya Singh.



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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21203	Course Name	DSC-VI: Agricultural Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	To focus on the study of soil properties, fertility, irrigation water quality and nutrient management to improve agriculture crop productivity. The course helps students to understand how soil health directly impacts agricultural output and sustainability.
Course Objective	- To impart knowledge on concepts of soil chemistry, chemical reactions, ion exchange reactions - To gain and understand the concepts of clay minerals and soil colloids - To explain the importance of organic matter and humus in improving soil fertility - To impart knowledge on the ability of a soil in supplying nutrients to plants for sustainable agriculture. - To understand the importance of soil fertility - To study the role of essential nutrients in plant growth - To learn about the criterias for irrigation water quality suitable for agriculture crop.
Pre-requisite	This syllabus requires a basic understanding of chemistry and biology and familiarity with basic soil science and agriculture, including soil composition, soil formation, and plant nutrients, is also helpful.
Course Outcome	After successful completion of this course, students will be able to: CO1: Explain the principles of soil chemistry, soil formation, and the properties of soil constituents. CO2: Analyze soil chemical reactions, soil pH, ion exchange, and their effects on nutrient availability.



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	CO3: Describe the role of soil organic matter and humus in maintaining soil fertility and productivity. CO4: Evaluate soil as a source of plant nutrients and explain the functions and uptake of essential plant nutrients. CO5: Assess irrigation water quality using salinity, sodicity, alkalinity, and permeability parameters for sustainable crop production.
Course Content	Unit-1: Soil Chemistry (07 Hrs) 1.1 Introduction and importance of soil 1.2 Soil formation: physical, chemical, biological weathering and pedogenesis 1.3 Soil: Clay Minerals- classification and properties 1.4 Soil Aggregates - formation, soil colloids and properties 1.5 The soil profile and types of soil and soil indicator plants Unit 2 Soil Chemical Reactions (08 Hrs) 2.1 Soil chemical reactions and importance 2.2 Factors controlling soil reactions 2.3 Soil pH and types of acidity 2.4 Influence of soil reaction on availability of nutrients 2.5 Adsorption and Ion Exchange: Cation and Anion Exchange Unit-3: Soil Organic Matter (10 Hrs) 3.1 Sources and composition 3.2 Factors affecting SOM 3.3 Role of SOM and importance of SOM in soil fertility 3.4 Humus/SOM: Formation - (i) Decomposition (ii) Synthesis and Properties 3.5 Humus/SOM: Decomposition- Reactions, Products and Factors Affecting 3.6 Fractionation of Humus/SOM 3.7 C: N Ratio and its Significance - Composition of Green Plant Materials Unit-4: Soil as a Source of Plant Nutrients (06 Hrs) 4.1 Plant growth factors 4.2 Crop production factors 4.3 Soil qualities and characteristics affecting crop growth 4.4 Soil Fertility-essential and beneficial elements Unit-5: Plant Nutrition Chemistry (06 Hrs) 5.1 Plant nutrients 5.2 Concentration and plants yield 5.3 Functions of nutrients in plants 5.4 Forms of elements in mineral soil 5.5 Forms of nutrient element absorbed by plants Unit-6: Assessment of Irrigation Water Quality (08 Hrs) 6.1 Irrigation water quality criteria 6.2 Salinity hazard 6.3 Sodium hazard



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	6.4 Salt index 6.5 Alkalinity hazard 6.6 Permeability hazard 6.6 Specific ion toxicity hazards
Practical	-
Reference Books	• Kaur H., 2015. Environmental Chemistry, Pragati Prakashan. • Boul, S.W., Hole, F.D. and Mc Cracken, R.J. 1995. Soil Genesis and Classification. Affiliated East West Press Pvt. Ltd. New Delhi. • Dilip Kumar Das. 2004. Introductory Soil Science. Kalyani Publishers, New Delhi. • Fundamentals of Soil Science . 2002. ISSS Publication, IARI, New Delhi. • Miller.C.E., and Turk, L.M. 2006. Fundamentals of Soil Science , Biotech Books,Trinagar, New Delhi

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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21204	Course Name	DSC-VI: Agricultural Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To Provide Hands on Training to students for Analysis of Agricultural Soil, Water and Plant sample for different Quality Parameters to determine their effect on Agriculture Crop Yield.
Course Objective	• To Determine different quality parameters to decide the irrigation water is suitable for agriculture crop production purpose. • To Determine different quality parameters to decide the soil is suitable for agriculture crop production purpose. • To justify the proper plant growth by checking certain parameters of plants.
Prerequisite	Basic laboratory skill



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Course Out come	● Students will be able to do analysis in chemistry laboratory to check the soil quality is suitable for agricultural purpose. ● Students will be able to do analysis in chemistry laboratory to check the water quality is suitable for crop irrigation purpose. ● Students will be able to check the plant growth.
Course Content	-
Practical	Any three 1. Determination of Cation Exchange Capacity (CEC) of agriculture soil sample. 2. Determination of C: N Ratio of agricultural soil sample. 3. Determination of moisture content of agricultural soil sample. 4. Determination of pH of agricultural soil sample and decide soil type. 5. Determination of electrical conductivity of saline soil sample to decide soil type and effect on agriculture crop. 6. Determination of Electrical Conductivity of Irrigation water sample and decide Salinity Classs of Water Sample. 7. Determination of pH of Irrigation Water Sample. 8. Determination of Chlorophyll Content of Green Plant Sample.
Reference Books	● Recent Advances in Environmental Analysis (water, soil and air)- B.S. Yadav (1 st Edition), Adhyayan Publishers. ● Analytical Techniques in Agriculture, Biotech and Environment Engineering- A. Nag , Eastern Economy Edition, Prentice hall of India Pvt. Ltd; New Delhi, 2006. ● Standard methods for the Examination of Water and Wastewater. A.D. Eaton. L.S. Clesceri. E.W. Rice. A. Greenberg. 24th Edition. 2024. APHA. AWWA. WEF. ● Analytical Chemistry, H. Kaur, 1st Edition, 2013, Pragati Prakashan.



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21205	Course Name	DSC-VII: Food and Dairy Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	The Food and Dairy Chemistry course is designed to give students a deep scientific understanding of food at the molecular level and to provide fundamental knowledge of milk chemistry, dairy products, quality control, and analytical methods used in the dairy industry.
Course Objective	- To understand the basics of food nutrients and its classification - To learn the various cooking process. - To study the food additives and flavoring agents. - To understand the chemical composition of milk. - To study the chemistry of dairy products. - To learn methods of milk analysis and quality control. - To understand dairy processing and preservation techniques.
Pre-requisite	Basic knowledge of Organic Chemistry, Biochemistry, and Food Chemistry.
Course Outcome	After completion of the course, students will be able to: CO-1: Gain understanding of food's chemical composition (macromolecules, nutrients, additives) and their importance in cooking, nutrition, and medical use. CO-2: Apply chemistry knowledge to cooking processes, optimizing nutrition and sensory quality. CO-3: Evaluate nutrient classification and sources to make informed dietary choices for health. CO-4: Critically analyze food additives in preservation and flavor, considering health impacts. CO-5: Explain the composition and properties of milk. CO-6: Understand the chemistry of dairy products. CO-7: Perform basic analytical tests on milk and dairy products. CO-8: Apply quality control measures in dairy industries.



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Course Content	Unit-1: Basics of food nutrients and its classification (08 Hrs) 1.1 Understanding the role of carbohydrates, proteins, and lipids in food systems, 1.2 Chemical structures and functions of macromolecules. 1.3 Carbohydrate-rich foods: Wheat, rice, potato, sugar, etc. 1.4 Protein-rich foods: Egg, milk, meat, fish, pulses, etc. 1.5 Fat-rich foods: Oil, ghee, butter, groundnut, etc. 1.6 Vitamins rich foods: Fruits, green leafy vegetables
	Unit-2: Chemistry of Cooking (07 Hrs) 2.1 Physical and Chemical changes 2.2 Stability of nutrients during cooking 2.3 Microwave cooking 2.4 Food sterilization 2.5 Chemistry of spices and herbs 2.6 Safety protocols and best practices in kitchen chemistry.
	Unit-3: Food Additives (08 Hrs) 3.1 Adulterants, and contaminants 3.2 Food preservatives like benzoates, propionates, sorbates, disulphites 3.3 Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose, and sodium cyclamate. 3.4 Flavors: Vanillin, alkyl esters (fruit flavors), and monosodium glutamate. 3.5 Artificial food colorants: Coal tar dyes and non-permitted colors and metallic salts. 3.6 Safety considerations and regulatory aspects of food additives in food production
	Unit-4: Composition and Chemistry of Milk (08 Hrs) 4.2 Definition and importance of milk 4.3 Chemical composition of milk 4.3 Water in milk 4.4 Milk proteins: Casein and whey proteins 4.5 Milk carbohydrates: Lactose 4.6 Milk fats and phospholipids 4.7 Vitamins and minerals in milk 4.8 Physical and chemical properties of milk
	Unit-5: Dairy Products and Processing (07 Hrs) 5.1 Chemistry of cream and butter 5.2 Cheese: manufacture and chemistry 5.3 Yogurt and fermented milk products 5.4 Ice cream chemistry 5.5 Condensed milk and milk powder 5.6 Pasteurization and sterilization 5.7 Homogenization of milk
	Unit-6: Milk Analysis and Quality Control (07 Hrs) 6.1 Sampling of milk 6.1 Determination of acidity of milk 6.2 Determination of fat content 6.3 Determination of SNF (Solids-Not-Fat) 6.4 Detection of common adulterants in milk 6.5 Quality standards of milk 6.6 Food safety regulations for dairy products
Practical	---



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Reference Books	• The Science of Cooking: Understanding the Biology and Chemistry behind Food and Cooking; Joseph J. Provost, Keri L. Colabroy, Brenda S. Kelly, Mark A. Wallert; ISBN: 978-1-118-67420-8. • Essential Guide To Food Additives by Victoria Emerton and Eugenia Choi https://books.rsc.org/books/edited-volume/21/Essential-Guide-to-Food-Additives • Food Additives Data Book by Jim Smith and Lily Hong-Shum. • Food Additives by A. Larry Branen, P. Michael Davidson, Seppo Salminen and John H. Thorngate III • Food and Nutrition Handbook for Extension Workers by Ministry of Agriculture, Animal Industry and Fisheries. • Textbook on Nutrition & Dietetics for Post Basic BSc Nursing Students by I. Clement. • Outlines of Dairy Technology – Sukumar De, Oxford University Press, New Delhi. • Milk and Milk Products – C. P. Ananthakrishnan, New India Publishing Agency, New Delhi. • Handbook of Food Analysis – S. Ranganna, Tata McGraw-Hill Publishing Company, New Delhi. • Dairy Chemistry and Animal Nutrition – M. C. Jain, Kalyani Publishers, New Delhi. • Textbook of Dairy Chemistry – S. K. Gupta, Kalyani Publishers, New Delhi.
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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21206	Course Name	DSC-VII: Food and Dairy Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To provide practical knowledge and laboratory skills related to the analysis, quality evaluation, and testing of Carbohydrate, Fat Rancidity, milk and dairy products using standard analytical methods.
Course Objective	- To introduce students to the basic chemical tests used for identifying carbohydrates in food samples. - To emphasize understanding fat spoilage and applying chemistry to ensure food safety. - To familiarize students with basic dairy chemistry laboratory techniques. - To develop skills in the analysis of milk and dairy products. - To perform quality control tests for milk and detect common adulterants. - To understand analytical methods used in dairy industries. - To interpret experimental results related to milk composition and quality.
Prerequisite	- Basic knowledge of general chemistry and analytical chemistry. - Understanding of fundamental concepts of food chemistry.
Course Outcome	Upon successful completion of the practical course, students will be able to: CO1: Students will be able to identify carbohydrates in common food samples using simple chemical tests (iodine for starch, Benedict's for reducing sugars). CO2: Students will be able to detect rancidity in fats/oils through sensory evaluation and peroxide value testing. CO3: Perform analytical tests and determine physicochemical properties of milk and dairy products. CO4: Detect milk adulterants and operate basic dairy analysis instruments safely and accurately. CO5: Analyze, interpret, and report dairy quality control data while understanding quality assurance and food safety practices in the dairy industry.



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Course Content	Any three 1. Determination of Carbohydrate identification using iodine solution for starch and Benedict's solution for reducing sugars. 2. To check the fat rancidity: Perform odor and simple peroxide value test of stored butter/oil sample. 3. Determination of acidity of milk by titrimetric method 4. Detection of common adulterants in milk
Reference Books	• Food Chemistry II: A Practical Manual - Prof. Shalini Sehgal & team • Textbook of Food Chemistry - Dr. Gayatri Vaidya • Practical Dairy Chemistry – A. K. Patra, CBS Publishers & Distributors, New Delhi. • Handbook of Food Analysis – S. Ranganna, Tata McGraw-Hill Publishing Company, New Delhi. Laboratory Manual in Dairy Chemistry – Indian Council of Agricultural Research (ICAR), New Delhi



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21207	Course Name	DSC-VIII: Physical Chemistry - III (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	This Course Paper proposes to teach about: different aspects of Chemical Kinetics and Thermodynamics.
Course Objective	Students will be able to learn: • Order of reaction, theories of reaction rate • Kinetics of complex and chemical reactions • Applications of chemical kinetics • Thermodynamics equilibrium and processes, work and energy, entropy, enthalpy, free energy, laws of thermodynamics, important equations their derivations and applications.
Prerequisite	• Basic concepts of chemistry (atoms, molecules, chemical reactions). • Knowledge of physical chemistry (mole concept, concentration, gas laws). • Basic chemical equilibrium concepts. • Basic mathematics (algebra, logarithms, simple graphs). • Basic physics (heat, work, energy, temperature, and pressure).
Course Out come	At the end of this course paper students will be able to deal with Order, molecularity, rate of chemical reactions – factors affecting it, kinetics and theories of complex and chemical reactions and applications in various fields, objectives and limitations of thermodynamic processes, laws of thermodynamics and its' significance, enthalpy, entropy, free energy, various isotherms, equations and their applications.
Course Content	Unit-1: Order and Molecularity of Chemical Reaction (06 Hrs) 1.1 Molecularity of reaction 1.2 Order of reaction with examples 1.2.1 Zero order reactions and Kinetics 1.2.2 Pseudo first order reaction 1.2.3 First order reactions and Kinetics 1.2.4 Second order reactions and Kinetics



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1.2.5	Third order reactions and Kinetics	
1.2.6	Kinetics of N^{th} order reactions	
1.3	Half life and mean life	
1.4	Order and molecularity of simple reactions	
1.5	Order and molecularity of complex reactions	
1.6	Numerical	
Unit-2: Theories of Reaction Rate		(07 Hrs)
2.1	Collision theory of reaction rate and limitation	
2.2	Effect of increase of temperature on reaction rate	
2.3	Transition state theory	
2.4	Activation energy and catalyst	
2.5	Lindemann mechanism	
2.6	Numerical	
Unit-3: Kinetics of Complex and Chemical Reactions		(08 Hrs)
3.1	Consecutive reactions	
3.2	Parallel or side reactions	
3.3	Reversible or opposing reactions	
3.4	Michaaelis-Menten relationship for Enzyme reaction	
3.5	Chain reactions	
3.6	Branching reactions	
3.7	Explosive reactions	
3.8	Influence of ionic strength	
3.9	Applications of Chemical Kinetics	
3.10	Numerical	
Unit-4: Thermodynamics-I		(06 Hrs)
4.1	Introduction	
4.2	Objectives and limitations	
4.3	Types of systems and properties	
4.4	State functions and thermodynamics equilibrium	
4.5	Thermodynamic processes	
4.6	The nature of energy, work, heat and temperature	
4.7	Internal energy: characteristics	
4.8	Exothermic and endothermic reactions	
Unit-5: Thermodynamics-II		(12 Hrs)
5.1	The Zeroth law of thermodynamics	
5.2	First law of thermodynamics and its' significance	
5.3	P-V work and Enthalpy	
5.4	Standard heat enthalpy and enthalpy of formation	
5.5	Applications of first law of thermodynamics	
5.6	Bond energy and enthalpy	
5.7	The spontaneous process and criterion of spontaneity	
5.8	The Entropy and entropy change	
5.9	Second law of thermodynamics	
5.10	Free energy and standard free energy changes and significance	
5.11	Absolute entropies and third law of thermodynamics	
Unit-6: Thermodynamics-III		(06 Hrs)
6.1	Free Energy:	
6.1.1	Helmholtz Free Energy	



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	6.1.2 Gibb's Free Energy 6.2 Free Energy Functions: 6.2.1 Helmholtz Free Energy Functions 6.2.2 Gibb's Free Energy Functions 6.3 Van't Hoff Isotherm 6.3.1 Derivation of the relation between ΔG and K_p 6.4 Clapeyron Equation: Derivation 6.4.1 Solid-liquid equilibrium 6.4.2 Liquid-gas equilibrium 6.5 Clapeyron-Clausius Equation: Integration form 6.5.1 Applications: Determination of M.W. from 6.5.1.1 Molal elevation constant 6.5.1.2 Molal depression constant 6.6 Numerical
Practical	-
Reference Books	• Gurdeep Raj ,Advanced Physical Chemistry; 20th Edition, (2017), Krishna Prakashan,. • Arun Bahl, B.S. Bahi, G.D. Tuli; Essentials of Physical Chemistry; 1st Revised Edition (2008), Reprint (2016), S. Chand and Company Limited. • K.K. Sharma and L.K. Sharma, Textbook of Physical Chemistry; 4th Edition, (2005), Vikas Publication, • Dr. Hemangi Desai ,et.al,Physical Chemistry for S.Y.B.Sc. Sem-4; 1st Edition,(2017), New Popular Prakashan, • P.Bahadur and P. Bahadur, Text Book of Chemistry; 6th Edition, 2001, Krishna Prakashan Media(P) Ltd. • M.V. Sangaranarayanan, V. Mahadevan, Textbook of Physical Chemistry, 1st Edition, 2011, University Press (India) Pvt. Ltd. • 7. Late B.R. Puri, L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry; 1st Revised Edition, 2013, Vishal Publishing Company. • P.C. Jain and Monica Jain, Text Book of Engineering Chemistry, 2016,Dhanpatrai Publishing Company. • Dr. Rajshree Khare, Text Book of Engineering Chemistry, Katson Books. • Mc Quarrie, D. A. & Simon, J. D., Molecular Thermodynamics, 1st Edition, (2004),Viva Books.



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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH21208	Course Name	DSC-VIII: Physical Chemistry - III (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To give hands on training to students for determination of various parameters of Chemical Kinetics and Thermodynamics/Thermochemistry.
Course Objective	To give hands on training to students for various chemistry laboratory experiments related to rate constant, order of reaction, conc. of acids, various reactions, heat of neutralization, heat of solutions, etc.
Prerequisite	- Familiarity with laboratory glassware and instruments. - Preparation of standard solutions. - Basic calculations (molarity, logarithms, graph plotting). - Observation, data recording, and report writing.
Course Out come	Students will be able to learn: - To determine rate-constant(K), order of reaction and rate-constant(K) - Relative strength of HCl and H₂SO₄ - To investigate the reaction of saponification - To find out the heat of neutralization, to determine the heat of solution, etc.
Course Content	-
Practical	Any three - Determination of the rate-constant(K) for the hydrolysis of methyl acetate catalysed by HCl. - Determination of the order of reaction and rate-constant(K) for the hydrolysis of ester (ethyl acetate) by alkali (NaOH). - Determination of the relative strength of HCl and H₂SO₄ by studying the hydrolysis of an ester. - To investigate the reaction of saponification of ethyl acetate by NaOH. - To find out the heat of neutralization of NaOH and HCl. - To determine the Heat of solution of organic acid (benzoic acid/ phthalic acid) by finding the solubility of the acid at two different temperature.



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Reference Books	• J.B. Yadav, Advanced Physical Chemistry; 14th Edition, 1995, Goel Publishing House. • S.K.Bhasin, Sudha Rani, Laboratory Manual on Engineering Chemistry; 3rd Edition, 2011, Dhanpatrai Publishing Company. • Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H.Freeman & Co.: New York (2003). • V.K. Ahluwalia, Sunita Dhingra, Adarsh Gulati, College Practical Chemistry; 1st Edition (2005), Reprint (2013), University Press India Pvt. Ltd.
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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH22201	Course Name	DSE-II: Bioinorganic Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	This syllabus aims to provide knowledge of the role of metal ions in biological systems, their functions in proteins and enzymes, metal transport, bioenergetics, health applications, toxicity, and recent advances in bio-inorganic chemistry.
Course Objective	- To develop an understanding of the importance of metal ions in biological systems - To inform their roles in proteins, enzymes, and bioenergetic processes, and their applications in health, medicine, biotechnology, and environmental science.
Pre-requisite	Basic knowledge of general chemistry, coordination chemistry, inorganic chemistry, and fundamental biology/biochemistry is recommended to understand the concepts of bio-inorganic chemistry.
Course Out come	After successful completion of the course, students will be able to: CO1: Explain the fundamental concepts of bio-inorganic chemistry and classify metal ions based on their biological functions. CO2: Describe the structure, properties, and biological roles of metalloproteins, metalloenzymes, and metal-containing biomolecules. CO3: Illustrate the mechanisms of metal ion transport, storage, electron transfer, and bioenergetic processes in living systems. CO4: Analyze the role of iron in oxygen transport, cooperative binding, and physiological functions of hemoglobin and myoglobin. CO5: Evaluate the toxicity of heavy metals, chelation therapy, and the therapeutic and diagnostic applications of metals in medicine. CO6: Discuss recent advances and emerging applications of bio-inorganic chemistry in biotechnology, nanobiomaterials, biosensors, and environmental science.
Course Content	Unit-1: Introduction to Bio-inorganic Chemistry (07 Hrs) Scope and importance of Bio-Inorganic Chemistry



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	Metal ions present in biological systems and their classification on the basis of action (essential, non-essential, trace and toxic). Coordination chemistry in biological molecules Hard and Soft Acid-Base (HSAB) concept in biological systems Biological ligands: Amino acids, peptides, proteins, porphyrins and nucleic acids Unit-2: Metalloproteins and Metalloenzymes (08 Hrs) 2.1 Structure and functions of metalloproteins 2.2 Hemoglobin and Myoglobin 2.3 Cytochromes and electron transport proteins 2.4 Iron-sulfur proteins 2.5 Zinc enzymes (Carbonic anhydrase, Carboxypeptidase) 2.6 Copper proteins (Hemocyanin, Ceruloplasmin) 2.7 Nickel-containing enzymes (Urease) Unit-3: Metal Ion Transport and Storage (07 Hrs) 3.1 Metal ion uptake in biological systems 3.2 Iron transport: Transferrin and Ferritin 3.3 Copper transport proteins 3.4 Calcium ion transport and signaling 3.5 Sodium-Potassium pump Unit-4: Bioenergetics and Electron Transfer (08 Hrs) 4.1 Biological oxidation and reduction 4.2 Electron transport chain 4.4 Role of cytochromes 4.5 ATP synthesis 4.5 Photosynthesis and chlorophyll 4.6 Nitrogen fixation and nitrogenase enzyme 4.7 Oxygen transport and storage Unit-5: Metal in Health (07 Hrs) 5.1 Toxicity of heavy metal ions (Hg, Pb, Cd and As) 5.2 Reasons for toxicity and their antidotes 5.4 Metals in Diagnosis: Gd, Fe 5.4 Metals in Treatments: Pt, Au 5.5 Chelation therapy (EDTA, BAL, Penicillamine) Unit-6 Recent Advances (08 Hrs) 6.1 Nanobiomaterials 6.2 Bio-inspired inorganic materials 6.3 Metal-based biosensors 6.4 Applications of bio-inorganic chemistry in biotechnology 6.5 Applications of bio-inorganic chemistry in environmental science
Practical	-



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Reference Books	• Principles of Bioinorganic Chemistry – Stephen J. Lippard and Jeremy M. Berg. • Bioinorganic Chemistry: A Short Course – Rosette M. Roat-Malone. • Inorganic Biochemistry – G. L. Eichhorn (Editor). • Bioinorganic Chemistry – Ivano Bertini, Harry B. Gray, Stephen J. Lippard, and Joan Selverstone Valentine. • Lehninger Principles of Biochemistry – David L. Nelson and Michael M. Cox (for biochemical background). • Bioinorganic Chemistry – S. P. Banerjee. • Inorganic Chemistry – Satya Prakash, G. D. Tuli, S. K. Basu, and R. D. Madan (Bio-inorganic chemistry chapters). • Advanced Inorganic Chemistry – Gurdeep Raj (includes bio-inorganic chemistry topics). • A Textbook of Inorganic Chemistry – P. L. Soni and Mohan Katyal. • Concise Inorganic Chemistry – J. D. Lee (widely used in Indian universities; includes bio-inorganic topics).
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Faculty	Science		Program	M.Sc. Organic Chemistry		
Year	2026		Version	2.0		
Semester	II		Effective From	June, 2026		
Course Code	MSCH22202	Course Name	DSE-II: Bioinorganic Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To develop practical skills in analytical and bioinorganic chemistry through the estimation, identification, and analysis of biologically important metal ions, water quality parameters, vitamins, and enzyme activity using modern and classical analytical techniques.
Course Objective	To develop laboratory skills in the analysis and estimation of biologically important substances using analytical and bioinorganic chemistry techniques
Prerequisite	Basic knowledge of analytical chemistry, inorganic chemistry, volumetric analysis, and laboratory safety.
Course Outcome	After successful completion of this practical course, students will be able to: CO1: Perform quantitative estimation of iron and vitamin C using spectrophotometric and titrimetric methods. CO2: Identify biologically important metal ions using qualitative analytical techniques. CO3: Determine calcium, magnesium, and water hardness using complexometric titration. CO4: Measure catalase enzyme activity and interpret experimental results using standard laboratory practices.
Course Content	--
Practical	Any three 1. Estimation of iron in pharmaceutical tablets by UV-Visible spectrophotometry using 1,10-phenanthroline. 2. Determination of calcium and magnesium in water samples by Complexometric titration. 3. Qualitative identification of biologically important metal ions (Fe^{3+}, Cu^{2+}, Zn^{2+}, Ca^{2+}, Mg^{2+}) using selective reagents. 4. Determination of water hardness before and after EDTA treatment.



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	5. Determination of vitamin C by iodometric titration (redox chemistry in biological systems). 6. Measurement of catalase activity from potato or liver tissue (enzyme involving iron).
Reference Books	• Vogel's Textbook of Quantitative Chemical Analysis – Vogel's Textbook of Quantitative Chemical Analysis (G. H. Jeffery, J. Bassett, J. Mendham & R. C. Denney) • Instrumental Methods of Chemical Analysis – Instrumental Methods of Chemical Analysis by Gurdeep R. Chatwal and Sham K. Anand • Practical Biochemistry – Practical Biochemistry by Keith Wilson and John Walker • Instrumental Methods of Chemical Analysis – Gurdeep R. Chatwal & Sham K. Anand • Practical Pharmaceutical Chemistry – S. H. Kale • A Textbook of Pharmaceutical Analysis – Dr. K. A. Shah & Dr. S. J. Mahajan



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Faculty	Science		Program		M.Sc. Organic Chemistry	
Year	2026		Version		2.0	
Semester	II		Effective From		June, 2026	
Course Code	MSCH23201	Course Name	SEC: Research Methodology-II (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
2	2	-	-	25	25	50

Purpose of Course	This course aims to develop advanced competencies in scientific research by emphasizing experimental planning, analytical instrumentation, scientific publishing, project management, innovation, entrepreneurship, and emerging technologies in chemical research.
Course Objective	- To strengthen research planning and experimental design skills. - To understand advanced analytical techniques and interpretation of scientific data. - To develop scientific writing and publication skills. - To familiarize students with research project management, funding, and entrepreneurship. - To understand innovation, technology transfer, and emerging interdisciplinary research.
Pre-requisite	Students should have: - Successful completion of Research Methodology-I. - Knowledge of basic statistics and laboratory practices. - Familiarity with scientific literature and referencing software.
Course Outcome	CO1: Design research projects using appropriate experimental methodologies. CO2: Interpret data generated from modern analytical instruments. CO3: Prepare manuscripts, project proposals, and technical reports following ethical publication practices. CO4: Apply principles of research management, innovation, and intellectual property commercialization. CO5: Evaluate recent advances and interdisciplinary applications of chemical research



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Organic Chemistry) Sem-I and II

Course Content	Unit-1: Advanced Research Design and Experimental Planning (08 Hrs) 1.1 Advanced research planning 1.2 Experimental design optimization 1.3 Factorial and response surface designs 1.4 Sampling strategies 1.5 Validation of analytical methods Unit-2: Advanced Analytical Techniques and Data Interpretation (08 Hrs) 2.1 Spectroscopic techniques (UV-Visible, IR, NMR) 2.2 Chromatographic techniques (GC, HPLC) 2.3 Thermal analysis (TGA, DSC) 2.4 Electron microscopy and X-ray techniques 2.5 Instrument calibration and validation Unit-3: Scientific Publication, Project Writing and Research Management (07 Hrs) 3.1 Research proposal writing 3.2 Project report preparation 3.3 Grant writing and funding agencies 3.4 Journal selection and manuscript submission 3.5 Peer-review process 3.6 Open-access publishing 3.7 Research metrics (Impact Factor, h-index, Citation Index) Unit-4: Innovation, Entrepreneurship and Emerging Research Areas (07 Hrs) 4.1 Innovation in chemical sciences 4.2 Technology transfer 4.3 Patent commercialization and licensing 4.4 Entrepreneurship and start-up ecosystem 4.5 Computational chemistry and molecular modelling 4.6 Sustainable technologies and circular economy 4.7 Future trends in chemical research
Practical	-
Reference Books	• C. R. Kothari, Research Methodology: Methods and Techniques. • Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners. • Wayne C. Booth, Gregory G. Colomb & Joseph M. Williams, The Craft of Research. • Day, R. A. & Gastel, B., How to Write and Publish a Scientific Paper. • Montgomery, D. C., Design and Analysis of Experiments. • Miller, J. N. & Miller, J. C., Statistics and Chemometrics for Analytical Chemistry. • ICH Guidelines on Good Laboratory Practices (GLP). • WIPO publications on Intellectual Property Rights. • ACS Style Guide for Scientific Writing.

