



SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

[M.Sc. Industrial Chemistry] Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSC	P2S01NCICH01	Pharmaceutical Chemistry-I	4-0-1	120	04

Course Learning Outcomes (CLOs)

On completion of this course, students will be able to:

CLO1: Understand and analyze the basic concepts of drugs and the ideal characteristics of drug-like compounds.

CLO2: Understand the mechanisms involved in drug synthesis and evaluate the structure–activity relationship (SAR) of drugs.

CLO3: Explain the methods of drug assay and evaluate the adverse effects of drugs.

CLO4: Explain and analyze the chemistry of drug action and drug metabolism.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Introduction to Pharmaceutical Chemistry General introduction to pharmaceutical chemistry, scope and objectives of pharmaceutical chemistry, drugs and medicines, classification of drugs, characteristics of ideal drugs, physicochemical properties of drugs, bactericidal and bacteriostatic drugs, biological and pharmaceutical terms used in pharmaceutical chemistry: pharmacokinetics, active pharmaceutical ingredient (API), receptor, affinity, intrinsic activity, bioisosteres, chemotherapy, pharmacodynamics, pharmacokinetics, drug toxicity, LD50, ED50, therapeutic index. Ancient Pharmaceutical Chemistry Ayurvedic medicine.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO2
II	Synthesis and Adverse Effects of Specific Classes of Drugs Antibacterial Agents Definition, synthesis, and adverse effects of Methicillin, Ampicillin, and Oxacillin. Antineoplastic Drugs Definition, types of cancer, synthesis, and side effects (if any) of antineoplastic drugs: Melphalan, 6-Mercaptopurine, and Thiotepe. Antimalarial Drugs Definition, classes, and synthesis of Mefloquine, Chloroquine, and Primaquine. Ancient Indian Methods Ancient Indian methods of isolation and extraction of drugs from medicinal plants.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO2, CLO3



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III	Theories of Drug Action Introduction, chemical defenses, absorption of drugs, structure–activity relationship (SAR), theories of drug action, nature of pharmaceutical action, occupancy theory, rate theory, induced fit theory, perturbation theory. Mechanism of Drug Action Drug action on enzymes, suppression of gene function, drug action on biological membranes, and nonspecific action of drugs. Ancient Indian Detoxification Processes Ancient Indian methods of detoxification processes.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO3, CLO4
IV	Assay of Drugs and Drug Metabolism Introduction, methods of bioassay, comparison of bioassay and chemical assay, metabolism of drugs, factors affecting metabolism, sites of metabolism. Metabolic Processes Phase-I and Phase-II reactions. Relation Between Chemical Structure and Activity Bioassay of Indian Drugs Antimicrobial, antibacterial, and anti-inflammatory drugs.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO3, CLO4

Assessment Methodologies

(A) Internal Assessment

a. Internal Formative assessment

- (a) Assignment/Continuous Assessment (15%)
- (b) Quizzes (5%)
- (c) Attendance (5%)

b. Internal Summative Assessment

- (a) Mid-term tests (25%)

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis & Above (A)	
I	CLO1, CLO2	30	1	2	10	13
II	CLO2	32	1	1	10	12
III	CLO1, CLO3	28	1	2	10	13
IV	CLO3, CLO4	30	1	1	10	12
		120	04	06	40	50



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● Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Written Exam 25 %, Assignment/Continuous, Assessment 10%, Quizzes 10%, Attendance 5%	50 %
2.	University Examination	Written Examination	50 %

(C) CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	3	1	1	1	1	2	-
CLO2	3	2	1	1	1	1	2
CLO3	2	3	2	2	2	-	-
CLO4	3	2	2	1	1	1	2

Values to CLO-PLO matrix are assigned by judging the importance of the particular CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

● Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Synthetic Drugs	Gurdeep R. Chatwal	2 nd Edition.	Himalaya Publishing House.
2	Textbook of Medicinal Chemistry (Vol – I & II)	S. Alagarsamy	2010	Elsevier.
3	Medicinal Chemistry	Ashutosh Kar	2018	New Age International publisher.
4	Foye's Principles of Medicinal Chemistry	David A. Williams and Thomas L. Lemke	5 th Edition	Lippincott Williams & Wilkins.



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5	Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry	John H. Block and John M. Beale, Jr.,	11 th Edition	Lippincott Williams & Wilkins.
6	Principles of Medicinal Chemistry (Vol. I & II)	S. S. Kadam, K. R. Mahadik, and K. G. Bothra	15 th Edition	Nirali Prakashan.
7	The Organic Chemistry of Drug Design and Drug Action	Richard B. Silverman	2 nd Edition	Academic Press.
8	An Introduction to Medicinal Chemistry	Graham L. Patrick,	2 nd Edition.	Oxford University Press.
9	Medicinal chemistry: A Biochemical Approach	Thomas Nogrady and Donald F. weaver	3 rd Edition.	Oxford University Press.
10	Basic Concept in Medicinal Chemistry	Marc W. Harrold and Robin M. Zavod	2013	American Society of Health-System Pharmacists (ASHP).

● Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Weblink
1	Indian Pharmacopeia Commission	https://www.ipc.gov.in/e-resources.html
2	Assay of Drugs and Drug Metabolism	https://content.e-bookshelf.de/media/reading/L-570577-5215a7b08a.pdf
3	Drug Metabolism	https://link.springer.com/chapter/10.1007/978-3-662-04383-7_4
4	Mechanism of Drug Action	https://www.phar.cam.ac.uk/files/moda_handbook_2022-23-compressed.pdf



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[M.Sc. Industrial Chemistry] Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSC	P2S01NCICH02	Chemical Technology	4-0-1	120	04

• Course Learning Outcomes (CLOs)

On completion of this course, students will be able to:

CLO1: Understand the basic concept of unit operation and unit process.

CLO2: Understand the reaction mechanisms, kinetics, and thermodynamics involved in unit operations and unit processes.

CLO3: Gain knowledge of raw materials, reagents, and reaction conditions required to carry out specific unit processes.

CLO4: Understand the materials of construction used in chemical industries.

CLO5: Understand the safety measures and hazard criteria related to unit processes.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Nitration Introduction to unit processes, unit operations and other related terms, Nitrating agents, Kinetics and mechanism of nitration of aromatic compounds, Nitration of paraffinic hydrocarbons, Nitrate esters, N-nitro compounds, Thermodynamics of nitration, Process equipment for technical nitration, Mixed acids for nitration, Typical industrial manufacturing processes. Life and work of Acharya Prafulla Chandra Ray: Father of Indian Chemical Sciences.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1
II	Sulfonation and Sulfation Introduction, Sulfonating and sulfating agents, Kinetics and mechanism, Desulfonation, Work-up procedures, Industrial equipment and techniques, Batch and continuous processes, technical preparation of some sulfonates and sulfates. Alchemical Ideas in the Vedas.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO2
III	a. Halogenation: Introduction, Kinetics and mechanism, Survey of halogenations, Catalytic chlorination, Photo halogenation, Design and construction of chlorinators, Some technical halogenations.	Classroom Learning (CL), ICT-enabled Learning (ICT),	CLO3, CLO4



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	b. Oxidation: Oxidizing agents, Liquid phase oxidation with oxidizing compounds, Some technical manufacturing processes involving oxidation. Work of Charak, Sushruta and others in methodizing and rationalizing medicinal chemistry.	Problem-Based Learning (PBL)	
IV	Esterification: Esterification by organic acid, Esterification by carboxylic acid derivatives, Esterification by addition to unsaturated systems, Esters of inorganic acids, selected technical manufacturing processes involving esterification. The transitional period of Hindu chemistry: Vrinda chakrapani et.al.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO5

● Assessment Methodologies

(D) Internal Assessment

a. Internal Formative assessment

- (d) Assignment/Continuous Assessment (15%)
- (e) Quizzes (5%)
- (f) Attendance (5%)

b. Internal Summative Assessment

- (b) Mid-term tests (25%)

(E) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis and Above (A)	
I	CLO1	30	1	2	10	13
II	CLO2	32	1	1	10	12
III	CLO3, CLO4	28	1	2	10	13
IV	CLO5	30	1	1	10	12
		120	04	06	40	50



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[M.Sc. Industrial Chemistry] Semester-I

● Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Written Exam 25 %, Assignment/Continuous, Assessment 10%, Quizzes 10%, Attendance 5%	50 %
2.	University Examination	Written Examination	50 %

(F) CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	3	2	1	-	1	2	1
CLO2	3	3	1	-	2	3	2
CLO3	2	3	2	1	2	3	3
CLO4	2	2	1	1	2	2	2
CLO5	2	2	3	3	1	2	2

Values to CLO-PLO matrix are assigned by judging the importance of the particular CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

● Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Unit Processes in Organic Synthesis	P. H. Groggins	5 th Edition,	McGraw-Hill Book Company.
2	Chemical Technology	F. A. Henglein	1 st English Edition, 1969,	Pergamon Press.
3	Outlines of Chemical Technology	M. Gopala Rao and Marshall Sittig	3 rd Edition,	East-West Press.
4	Principles of Industrial Chemistry	Chris A. Clausen III and Guy Mattson,	2nd Edition,	Wiley–Blackwell.



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5	Industrial Chemicals	Lowenheim and Moran,	4 th Edition	Wiley.
6	Encyclopedia of Chemical technology	Kirk and Othmer,	4 th and 5 th Editions	Wiley.
7	Kent and Riegel's Handbook of Industrial Chemistry and Biotechnology	James A. Kent,	11 th Edition	Springer.
8	A Textbook of Chemical Technology, Volume-II	S. D. Shukla and G. N. Pandey	2 nd Edition	Vikas Publishing House.
9	Industrial Organic Chemistry	Klaus Weissermel and Hans-Jürgen Arpe,	1 st Edition, 2003	Wiley-VCH.
10	History of Hindu Chemistry	Prafulla Chandra Ray,	Vol-I & II,	Bengal Chemical Printing Works.

• Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Weblink
1	NPTEL online courses	https://swayam.gov.in/nc_details/NPTEL
2	Organic Mechanism	https://ndl.ethernet.edu.et/bitstream/123456789/63842/1/2010_Book_OrganicMechanisms.pdf
3	Organic Reaction Mechanism	https://egyankosh.ac.in/bitstream/123456789/104007/1/Unit%209.pdf
4	Esterification	https://www.organic-chemistry.org/synthesis/C1O/esters/esterifications.shtm
5	Sulphonation and sulphination	https://www.chemithon.com/Resources/pdfs/Technical_papers/Sulfo%20and%20Sulfa%201.pdf



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[M.Sc. Industrial Chemistry] Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSC	P2S01NCICH03	Industrial Safety Management-I	4-0-1	120	04

Course Learning Outcomes (CLOs)

After completion of the course, students will be able to:

CLO1: Identify and understand the roles and duties involved in industrial safety management and evaluate workplace hazards in industrial environments.

CLO2: Understand the basics of safety management and apply the principles of hazard communication, including the use of Material Safety Data Sheets (MSDS) and Safety Data Sheets (SDS).

CLO3: Develop basic knowledge of emergency response procedures for industrial accidents (e.g., chemical spills and explosions).

CLO4: Understand the need, importance, limitations, and standards of Personal Protective Equipment (PPE) used in industrial and laboratory safety.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Safety Management - Concept of Management, Definitions, Nature and Importance of Management, Elements of Management Functions: - Safety Organization: Hierarchy, Roles, Management by Objectives (MBO), - Government's Role, - Safety Programmes, - Design and Development of Training, - Training of Workers and Supervisors, - Individual vs. Mass Training, - Fundamentals of Safety in Ancient India.	Classroom learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO2
II	Safety In Chemical Industries - Importance of Chemical Industries: - Need for Safety in the Chemical Industry, - Types of Chemical Hazards and Their Controls, - Material Property Hazards and Their Controls, - Storage Hazards and Their Controls, - Inspection, Testing and Maintenance, - Work Permits for Hazardous Operations and Work Permits for Vessel Entry, - Ancient Indian Practices of Chemical Safety.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO2,



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III	Fire and Explosion Fire Phenomena, Nature of Fire and Need of Fire Safety, Factors Contributing to Fire, Common Cause of Industrial Fire, Classification of Fire and Extinguishers, Statutory and other Standards-Indian Standards, Design for Fire Safety, Fire resistance of Building Materials, Fire Safety of Building, Plant Exit Equipment, Fire Prevention and Protection systems, Fire Suppression or Extinguishing Systems, Fire Emergency Action Plan & Drill, Explosion Phenomena, Inspection, Maintenance and Training for Fire Detection and Alarm Systems Fire Protection, Worked Examples.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO3
IV	Personal Protective Equipment Need and Limitation, Indian & Other Standards, Selection and Classification, Non respiratory equipment-Head, Hair, Ear, Face, Eye Hand, Arm, Body, Skin & Fall Protection, Respiratory Equipment, Classification of Respiratory Hazards - Oxygen Deficiency, Gaseous Contaminants, Air Supplying Respirators, OSHA standard for Respiratory Protection, Training Maintenance, Precaution and Care of PPE, Detection Equipment, PPE Testing Procedures & Standards.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO4

● Assessment Methodologies

(G) Internal Assessment

a. Internal Formative assessment

- (g) Assignment/Continuous Assessment (10%)
- (h) Quizzes (10%)
- (i) Attendance (5%)

b. Internal Summative Assessment

- (c) Mid-term tests (25%)

(H) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis & Above (A)	
I	CLO1	30	1	2	10	13
II	CLO2	32	1	1	10	12
III	CLO3	28	1	2	10	13
IV	CLO4	30	1	1	10	12
		120	04	06	40	50



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[M.Sc. Industrial Chemistry] Semester-I

● Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Written Exam 25 %, Assignment/Continuous Assessment 10%, Quizzes 10%, Attendance 5%	50 %
2.	University Examination	Written Examination	50 %

(I) CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	2	3	3	2	1	1	1
CLO2	2	3	3	2	2	1	1
CLO3	2	3	3	2	1	1	1
CLO4	2	2	3	2	2	-	1

Values to CLO-PLO matrix are assigned by judging the importance of the particular CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

● Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Industrial Safety and Health Management	David W. Rieske and C. Ray Asfahl,	6 th Edition	Pearson Education.
2	Fundamentals of Industrial Safety and Health	Dr. K. U. Mistry	2008	Siddharth Prakashan.
3	Fundamental Principal of Occupational Health and Safety	Benjam O. Alli	2nd Edition	International Labour Organization (ILO), Geneva.
4	Safety and Hazards Management in Chemical Industries	M. N. Vyas	2013	Atlantic Publishers & Distributors (P) Ltd.
5	Handbook of Fire and Explosion Protection Engineering Principles	Dennis P. Nolan	3 rd Edition	Elsevier



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- Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Weblink
1	Industrial Safety Management	https://hsseworld.com/wp-content/uploads/2020/08/Industrial-Safety-Management.pdf
2	Practical Guide to Industrial Safety	https://ftp.idu.ac.id/wp-content/uploads/ebook/ip/BUKU%20MANAJEMEN%20SAFETY/SAFETY%20INDUSTRY/Practical%20Guide%20to%20Industrial%20Safety%20Methods%20for%20Process%20Safety%20Professionals%20by%20Cheremisnoff%20(z-lib.org).pdf
3	Safety In Chemical Industries	https://www.prsu.ac.in/admin/theme/tender/6790.pdf
4	Fire and Explosion	https://www.incubkal.com/RefBooks/Handbook%20of%20Fire%20and%20Explosion%20Protection%20Engineering%20Principles,%20Third%20Edition-%20for%20Oil,%20Gas,%20Chemical%20and%20Related%20Facilities.pdf
5	Occupational safety and Health Administration	https://www.osha.gov/sites/default/files/publications/OSHA3151.pdf



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[M.Sc. Industrial Chemistry] Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSC	P2S01NCICH04	Industrial Chemistry Practical-I	0-8-0	120	04

Course Learning Outcomes (CLOs)

On completion of this course, students will be able to:

CLO1: Learners will understand the synthesis of compounds and salts.

CLO2: Learners will understand the procedures and reactions involved in the estimation of compounds and pharmaceutical formulations.

CLO3: Students will be trained in sampling, sample preparation, and standardization techniques.

CLO4: Students will gain supervised experience in essential practical tasks related to their professional studies.

CLO5: This course provides knowledge of various analytical techniques.

Sr. No.	Course Content	Learning Pedagogies*	CLO(s)
Part-I	Preparation and Assay: 1. Preparation of Potash alum. 2. Preparation of Mohr's salt ($\text{FeSO}_4\text{NH}_4\text{SO}_4 \cdot 6\text{H}_2\text{O}$). 3. Colorimetric assay of iron tablets. 4. Volumetric assay of iron tablets. 5. Determination of the neutralization capacity of antacids.	Experimental Learning (EL), Reflective learning,	CLO1, CLO2, CLO3, CLO4, CLO5
Part-II	Estimation: 1. Determination of oil content in oil seeds using hexane solvent by Soxhlet extraction. 2. Separation of acetone–water mixture by simple distillation. 3. Determination of distribution coefficients in various solvent systems. 4. Estimation of vitamin- C. 5. Estimation of Boric Acid.	Experimental Learning (EL), Reflective learning	CLO1, CLO2, CLO3, CLO4

● Assessment Methodologies

(J) Internal Assessment

a. Internal Formative assessment

- (d) Lab Journal/Record and Method of Working (15%)
- (e) Attendance and Laboratory Discipline (10%)

b. Internal Summative Assessment

- (a) Practical Examination and Viva Voce (25%)



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[M.Sc. Industrial Chemistry] Semester-I

(K) Weightage of Learning Efforts for External Assessment

Sr No	Aligned COs	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis & Above (A)	
Part-I	CLO1, CLO2, CLO3, CLO4, CLO5	60	5	5	15	25
Part-II	CLO2, CLO3, CLO4, CLO5	60	5	5	15	25
		120	10	10	30	50

● Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Internal Examination, (Internal Practical Examination - 20%; Viva Voce - 5%; Lab Journal/Record & Method of Working -15% and Attendance & Laboratory Discipline - 10%)	50 %
2.	University Examination	Practical Exam and Viva-voce	50 %

(L) CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	1	3	2	-	2	1	-
CLO2	1	3	1	1	3	1	1
CLO3	2	3	1	1	3	1	-
CLO4	1	3	1	2	2	1	1
CLO5	2	2	1	-	3	2	2

Values to CLO-PLO matrix are assigned by judging the importance of the particular CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-



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[M.Sc. Industrial Chemistry] Semester-I

• Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis	V. K. Ahluwalia and Renu Aggarwal	2004	Universities Press (India) Pvt. Ltd./Orient Blackswan
2	Advanced Practical Inorganic Chemistry	Gurdeep Raj	2012	Goel publishing House, Meerut.
3	Vogel's Textbook of Practical Organic Chemistry	B. S. Furniss, A. J. Hannaford, P. W. G. Smith, and A. R. Tatchell (Originally by A. I. Vogel),	5 th Edition,	Pearson Education India.
4	Industrial Instrumentation and Control	S. K. Singh	3 rd Edition	McGraw Hill Education India Pvt. Ltd., New Delhi.
5	Instrumental Methods of Chemical Analysis	Gurdeep R. Chatwal and Sham K. Anand	2011	Himalaya Publishing House Pvt. Ltd.

• Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Weblink
1	Chemistry LibreTexts	https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments
2	Organic Chemistry Virtual labs	https://oc-amrt.vlabs.ac.in/
3	eGyanKosh Quantitative Analysis	https://egyankosh.ac.in
4	Colorimetric Analysis	https://www.dairyknowledge.in/sites/default/files/10.8.pdf
5	Comprehensive Practical Organic Chemistry	https://books.google.co.in/books?id=906Ye4nM9A4C&printsec=copyright#v=onepage&q&f=false



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[M.Sc. Industrial Chemistry] Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSC	P2S01NCICH05	Industrial Chemistry Practical-II	0-8-0	120	04

• Course Learning Outcomes (CLOs)

On completion of this course, students will be able to:

CLO1: Understand the separation and identification of organic mixture and quantitative analytical procedure.

CLO2: Evaluate the procedures for separation of multicomponent mixtures.

CLO3: Understand and develop skills in organic laboratory practices.

CLO4: Apply volumetric technique to determine amount of chemical entity with high analytical precision.

Sr No		Learning Pedagogies*	CLO(s)
Part-I	Problem Based Learning: Students will be given an unknown organic mixture as listed for separation and identification using logical analytical methods: Solid Acid: Benzoic acid, Salicylic acid, Cinnamic acid, Phthalic acid, Succinic acid, Oxalic acid. Solid phenol: α -Naphthol, β -Naphthol, Resorcinol. Solid neutrals: p-Dichlorobenzene, Naphthalene, Anthracene, Benzamide, Urea, Thiourea, Acetanilide, m-Dinitrobenzene. Solid Base: o-, m-, and p-Nitroaniline, p-Toluidine, Liquid base: Aniline Neutral Liquid: Ethyl acetate, Methyl acetate, Acetone, Methanol, Ethanol, Benzaldehyde, Chlorobenzene, Nitrobenzene, Chloroform, Acetophenone.	Experimental Learning (EL), Reflective learning	CLO1, CLO2, CLO3
Part-II	Estimation and Preparation: 1. Determination of % of CaCO_3 in a given toothpaste sample. 2. Determination of sugar content using Fehling 's solution. 3. Detection of adulteration in milk. 4. Biodiesel production from vegetable oil. 5. Preparation of liquid soap from glycerin.	Experimental Learning (EL), Reflective learning	CLO1, CLO3, CLO4

Assessment Methodologies

(M) Internal Assessment

a. Internal Formative assessment

(a) Lab Journal/Record and Method of Working (15%)

(b) Attendance and Laboratory Discipline (10%)



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b. Internal Summative Assessment

(a) Practical Examination and Viva Voce Examination (25%)

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned Cos	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis & Above (A)	
I	CLO1, CLO2, CLO3	30	5	5	15	25
II	CLO1, CLO3, CLO4	30	5	5	15	25
		60	10	10	30	50

• Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Internal Examination (Internal Practical Examination - 20%; Viva Voce - 5%; Lab Journal/Record & Method of Working - 15% and Attendance & Laboratory Discipline - 10%)	50 %
2.	University Examination	Practical Exam/Viva-Voce Examination	50 %

• CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	2	3	1	-	2	1	1
CLO2	2	3	2	-	2	1	-
CLO3	1	3	1	2	3	1	1
CLO4	2	3	2	1	2	2	-

Values to CLO-PLO matrix are assigned by judging the importance of the particular CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-



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● Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Comprehensive Practical Organic Chemistry: Preparations and Quantitative Analysis	V. K. Ahluwalia and Renu Aggarwal	2004	Universities Press (India) Pvt. Ltd.
2	Advanced Practical Inorganic chemistry	Gurdeep Raj	2012	Goel Publishing House, Meerut.
3	Vogel's Textbook of Practical Organic Chemistry	A. I. Vogel, B. S. Furniss, A. J. Hannaford, P. W. G. Smith, and A. R. Tatchell,	8 th Edition (2011)	Pearson Education India.
4	Industrial Instrumentation and Control	S. K. Singh	3 rd Edition	McGraw Hill Education, New Delhi.
5	Instrumental Methods of Chemical Analysis	Gurdeep R. Chatwal and Sham K. Anand	2011	Himalaya Publishing House.

● Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Weblink
1	Chemistry LibreTexts	https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments
2	Comprehensive Practical Organic Chemistry	https://books.google.co.in/books?id=906Ye4nM9A4C&printsec=copyright#v=onepage&q&f=false
3	Adulteration in milk	https://aaui.in/sites/default/files/qualitative_tests_for_detection_of_common_adulterants_in_milk_oct2021.pdf
4	IGNOU eGyanKosh – Qualitative Organic Analysis	https://egyankosh.ac.in/handle/123456789/24827
5	Biodiesel Production	https://www.youtube.com/watch?v=doR7WEdlOk



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Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course Credits
			L-P-T		
DSE	P2S01NEICH01	Selected Topics in Organic Chemistry-I	2-0-1	60	02

• Course Learning Outcomes (CLOs)

On completion of this course, students will be able to:

CLO1 : Understand the properties, mechanisms, and synthetic applications of important organic reagents

CLO2 : Explain the role of selected reagents and reaction strategies in carrying out functional group transformation

CLO3 : Apply the principles of disconnection approach for planning the synthesis of organic compounds.

CLO4 : Analyze one-group and two-group disconnections for the synthesis of alcohols, olefins, ketones, acids, and their derivatives using retrosynthetic strategies.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Selected Reagents in Organic Chemistry Lithium di-isopropylamide (LDA), N,N'-Dicyclohexylcarbodiimide (DCC), Tributyltin hydride (TBTH), Trimethylsilylhydride (TMS-X), 1,3-Dithiane, Lead tetraacetate (Pb(OAc) ₄), Gilman reagent (R ₂ CuLi), N-Bromosuccinimide (NBS), SeO ₂ (Selenium dioxide), OsO ₄ (Osmium tetroxide), DDQ (2,3-Dichloro-5,6-dicyanobenzoquinone), K ₃ [Fe(CN) ₆] (potassium ferricyanide). Historical evolution of organic chemistry highlighting contributions from ancient Indian knowledge systems and traditional chemical practice.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO1, CLO2
II	Disconnection Approach in Organic Synthesis Introduction to disconnection approach, Definition of functional group interconversion (FGI), Synthons, Target molecule, Synthetic equivalent, One group disconnection - derivatives of alcohols and olefins, preparation of aryl ketones and acids, saturated hydrocarbon. Two group disconnection – synthesis of alcohol, olefine, simple ketone, acids and its derivatives. Chemoselectivity, Regioselectivity, stereoselectivity and protection of functional groups. Classical approaches versus modern concepts and processes in organic synthesis.	Classroom Learning (CL), ICT-enabled Learning (ICT), Problem-Based Learning (PBL)	CLO3, CLO4



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● Assessment Methodologies

(N) Internal Assessment

a. Internal Formative assessment

(j) Assignment/Continuous Assessment (10%)

(k) Quizzes (10%)

(l) Attendance (5%)

b. Internal Summative Assessment

(f) Mid-term tests (25%)

(O) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate Weightage (Marks) According to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analysis & Above (A)	
I	CLO1, CLO2	30	2	3	8	13
II	CLO3, CLO4	30	2	2	8	12
		60	4	5	16	25

● Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage
1.	Continuous Internal Examination	Written Exam 25 %, Assignment/Continuous Assessment 10 %, Quizzes 10 %, Attendance 5 %	50 %
2.	University Examination	Written Exam / Viva-Voce	50 %

(P) CLOs – PLOs Matrix

CLO	PLO						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7
CLO1	3	2	1	-	1	-	1
CLO2	3	2	2	-	1	1	1
CLO3	3	3	1	-	1	2	2
CLO4	3	3	1	-	1	2	2

Values to CLO-PLO matrix are assigned by judging the importance of the CLO in relation to the PLOs.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-



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- Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Organic Reaction Mechanisms	V. K. Ahluwalia and Rakesh Kumar Parashar	4 th Edition	Narosa Publishing House.
2	Organic Reactions and Their Mechanisms	P. S. Kalsi	5 th Edition	New Age International Publishers.
3	Modern Methods of Organic Synthesis	W. Carruthers and Iain Coldham	4 th Edition (2005)	Cambridge University Press.
4	Organic Synthesis: The Disconnection Approach	Stuart Warren and Paul Wyatt	2 nd Edition (2008)	Wiley.

- Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	e-PG pathshala	https://epgp.inflibnet.ac.in/
2	Advance organic chemistry NPTEL online lecture	https://swayam.gov.in/NPTEL
3	Disconnection Approach in Organic Synthesis	https://download.e-bookshelf.de/download/0003/7377/92/L-G-0003737792-0002367424.pdf