DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. III, IV, V, VI Semester

INDUSTRIAL CHEMISTRY

(Based on Choice Based Credit System)

SESSION : 2024-25

ESTD : 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG, (CG)

DEPARTMENT OF CHEMISTRY

Four Year Undergraduate Program
INDUSTRIAL CHEMISTRY
B.Sc. Semester- III & IV

COURSE CURRICULUM 2024-25

For DSC and GEC

COURSE CURRICULUM

DEPARTMENT OF CHEMISTRY

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG (C.G.)

Four Year Undergraduate Program

B.Sc. (INDUSTRIAL CHEMISTRY) Semester III, IV, V & VI
(Based on NEP-2020)

Session 2024-25

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG
Approved Curriculum for
B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for Session 2024-25
Scheme and Course Curriculum for B.Sc. Year 2 (Semester III & IV)
Scheme for B.Sc. Program with Industrial Chemistry - Second Year
(with 3 Subjects A, B*, C*Subject A- Industrial Chemistry)

Semester	Discipline Specific Course/ Core Course DSC (Credit-4)	Generic Elective Course GEC/ Discipline Specific Elective DSE (Credit-4)	Skill Enhancement Course SEC (Credit-2)	Ability Enhancement Course AEC (Credit-2)	Value Added Course VAC (Credit-2)	Total Credits
3	Subject A3: Industrial Chemistry--III **Polymeric materials and unit processes in organic chemicals manufacture** (Th=3, P=1) Subject B3 (Th=3, P=1) Subject C3 (Th=3, P=1)	Choose one from a pool of courses DSE A/B/C Or Choose one from a pool of courses GEC-3 (Th=3, P=1)	Choose 1 from pool of SEC (Th=1, P=1) Or Internship/ Apprenticeship/Project/ Community outreach (2)	English Language (Th-2)	Choose one from a pool of courses (2)	22
4	Subject A4: Industrial Chemistry -IV **Unit processes, Instrumentation and industrial safety measures** (Th=4, P=2) (Th=3, P=1) Subject B4 (Th=3, P=1) Subject C4 (Th=3, P=1)	Choose one from a pool of courses DSE-2 A/B/C Or Choose one from a pool of courses GEC-4 (Th=3, P=1) (Th=3, P=1)	Choose 1 from pool of SEC (Th=1, P=1) Or Internship/ Apprenticeship/Project/ Community outreach (2)	Hindi Language (Th-2)	Choose one from a pool of courses (2)	22

Students on exit shall be awarded undergraduate Diploma (in the Field of Multidisciplinary study) after securing the requisite 88 credits on completion of Semester IV

(Total Credits: Sem 1 - 22, Sem 2 – 22, Sem 3 – 22 and Sem 4 – 22; TOTAL - 88 credits)

***Subjects B/C:** Mathematics/Physics/Botany/Zoology/ Chemistry

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG

Approved Curriculum for

B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for the Session 2024-25

Scheme and Course Curriculum for B.Sc. Year 2 (Semester III & IV)

Courses and Marking Scheme for Second-year B.Sc. with Industrial Chemistry

Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits	Marks	Sem End	IA
For Diploma								
Discipline Specific Courses – DSC (Core Courses)/Generic Elective Course - GEC								
2	III	CZIC/CMI C 301: Industrial Chemistry - III	Polymeric materials and unit processes in organic chemicals manufacture	Theory	3	100	80	20
		CZIC/CMI C 301	Lab Course - 3	Practical	1	50		
	IV	CZIC/CMI C 401: Industrial Chemistry - IV	Unit processes Instrumentation and industrial safety measure	Theory	3	100	80	20
		CZIC/CMI C 401	Lab Course - 4	Practical	1	50		
2	**Skill Enhancement Courses - SEC**							
	III & IV	CZIC/CMI C 01	Basic Principles and Laboratory Operations	Theory	1	25		
				Practical/ Project	1	25		
		CZIC/CMI C 02	Instrumental Methods of Analysis	Theory	1	25		
				Practical/ Project	1	25		
Discipline Specific Electives – DSE (Core Courses)								
2	III	ICSE 302	Analytical Methods in Chemistry	Theory	3	100	80	20
		ICSEL 301	Lab Course - 1	Practical	1	50		
	IV	ICSE 402	Molecules of Life	Theory	3	100	80	20
		ICSEL 402	Lab Course - 2	Practical	1	50		

Note: Semester End – **80%** and Internal Assessment (IA) – **20%** (Weightage of marks internal examinations will be included as per guidelines of Autonomous Examination Cell)
Minimum pass requirement: 40% in End Semester and IA separately.

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG
Approved Curriculum for
B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for Session 2024-25
Scheme and Course Curriculum for B.Sc. Year 3 (Semester V & VI)
Scheme for B.Sc. Program with Industrial Chemistry - Third Year
(with 3 Subjects A, B*, C*Subject A- Industrial Chemistry)

Semester	Discipline Specific Course/ Core Course DSC (Credit-4)	Generic Elective Course GEC/ Discipline Specific Elective DSE (Credit-4)	Skill Enhancement Course SEC (Credit-2)	Ability Enhancement Course AEC (Credit-2)	Value Added Course VAC (Credit-2)	Total Credits
5	Subject A3: Industrial Chemistry--V **Industrial Economics** (Th=3, P=1) Subject B3 (Th=3, P=1) Subject C3 (Th=3, P=1)	Choose two from a pool of courses DSE A/B/C Or Choose one from a pool of courses GE-5 & GE-6 (Th=3, P=1)	Choose 1 SEC (Th=1, P=1) Or Internship/ Apprenticeship/ Project/ Community outreach (2)	-	-	22
6	Subject A4: Industrial Chemistry--VI **Pharmaceuticals** (Th=3, P=1) Subject B4 (Th=3, P=1) Subject C4 (Th=3, P=1)	Choose two from a pool of courses DSE A/B/C Or Choose one from a pool of courses GE-7 & GE-8 (Th=3, P=1)	Internship/ Apprenticeship/Project/ Community outreach (2)	-	-	22

Students on exit shall be awarded undergraduate Diploma (in the Field of Multidisciplinary study) after securing the requisite 132 credits on completion of Semester VI

***Subjects B/C:** Mathematics/Physics/Botany/Zoology/ Chemistry

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG
Approved Curriculum for
B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for the Session 2024-25

Scheme and Course Curriculum for B.Sc. Year 3 (Semester V & VI)

Courses and Marking Scheme for Third-year B.Sc. with Industrial Chemistry

Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits	Marks	Sem End	IA
For Diploma								
Discipline Specific Courses – DSC (Core Courses)/Generic Elective Course - GEC								
3	V	CZIC/CMI C 501	Industrial Economics	Theory	3	75	60	15
		CZIC/CMI C 501	Lab Course - 5	Practical	1	25		
	VI	CZIC/CMI C 601	Pharmaceuticals	Theory	3	75	60	15
		CZIC/CMI C 601	Lab Course - 6	Practical	1	25		
3	**Skill Enhancement Courses - SEC**							
		ICSEC 01/02/03	Basic Principles and Laboratory Operations/ Instrumental Methods of Analysis/ Drugs and Pharmaceutical Chemistry	Theory	1	25	20	05
				Practical/ Project	1	25		
Discipline Specific Electives – DSE (Core Courses)								
3	V	CZICE/CMICE 503	Data Analysis and Separation Techniques	Theory	3	75	60	15
		CZICE/CMICE 503	Lab Course - 3	Practical	1	25		
	VI	CZICE/CMICE 603	Inorganic Materials of Industrial importance	Theory	3	75	60	15
		CZICE/CMICE 603	Lab Course - 4	Practical	1	25		

Note: Semester End – 80% and Internal Assessment (IA) – 20% (Weightage of marks internal examinations will be included as per guidelines of Autonomous Examination Cell)

Minimum pass requirement: 40% in End Semester and IA separately.

DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25
INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -III		Session:2024-2025
1	Course Code	CZIC/CMIC 301: INDUSTRIAL CHEMISTRY-III		
2	Course Title	Polymeric Materials and Unit ProcessesinOrganicChemicalsManufacture		
3	Course Type	Discipline Specific Core (DSC)/ Generic Elective (GEC)		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • To have basic idea of materials, cement and ceramics, nature of materials their properties, applications, manufacturing of quality products and its economic relevance. • To understand about polymeric material, glasses and composites, their properties, formation, crystallization and structure with wide industrial applications. • To acquire basic electrochemical knowledge of corrosion processes, corrosion forms and their repercussions and able to apply corrosion protection measures. • To understand about unit processes in organic chemicals manufacture involving nitration, halogenations,chloro-compounds, sulphonation and mechanism of processes. • To understand about oxidation reaction, commercial manufacture of important organic compound by oxidation with mechanism.		
5	Credit Value	3Credits	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Material Science:Mechanical properties of material and change with respect to temperature Cement:Types of cement, composition, manufacturingprocess, setting of cement. Ceramic:Introduction, Types, Manufacturing process, Applications, Refractories.	9
II	Polymeric materials:Industrial polymer and composite materials, their constitution, chemical and physical properties, industrial applications. Glass:Types, composition,manufacture, physical and chemical properties, Applications. Corrosion:Various types of corrosion relevant to chemical industry - mechanism and preventive method.	9
III	Nitration: Introduction, Nitrating agents, mechanism of nitration processes such as nitration of:- Paraffinic hydrocarbons, Benzene to nitrobenzene and m-dinitrobenzene, Chlorobenzene to o- and p- nitrochloro benzenes, Acetanilide to p-nitroacetanilide, Toluene	9

IV	Halogenation:Introduction – mechanism of halogenation reactions, reagents for halogenations, Halogenation of aromatic-side and nuclear halogenations, commercial manufacture of chlorobenzenes, chloral, monochloroacetic acid and chloromethane, dichlorodifluoro methane. Sulphonation:Introduction, sulphonating agents, chemical and physical factors in sulphonation. Mechanism of sulphonation reaction, Commercial sulphonation of benzene, naphthalene, alkyl benzene.	9
V	Oxidation:Introduction, Types of oxidation reactions, oxidizing agents, mechanism of oxidation of organic compounds liquid phase oxidation, vapour phase oxidation, commercial manufacture of benzoicacid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.	9

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

Reference Books

1. Pollution control in chemical & allied industries, S.P. Mahajan.
2. Pollution Control in Industries, A Series of Books by Jones H.P.
3. Science of Ceramic chemical processing, HenchL.L.
4. Science of Ceramics, Stewarts G.H.
5. Properties of Glass, Morcy G. W.
6. Chemistry of Glasses, Paul A.
7. Corrosion-causes and prevention, Spellur F.N.

Online Resources:

- https://gpadampur.files.wordpress.com/2015/08/3-2-fcn-practical.pdf

  http://sihfwup.in/content/assets/pdf/CME/Nutritional_Deficiency_Disease_Book.pdf
- https://onlinecourses.swayam2.ac.in/cec20_ag10/preview
- https://onlinecourses.nptel.ac.in/noc23_ag19/preview
- https://archive.nptel.ac.in/courses/103/107/103107088/

(e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Comprehensive Evaluation (CCE): **20 Marks**

Semester End Exam (SEE): **80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B:(Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**

Name &Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
SubjectExpert..... (UniversityNominee)	1..... Dr. V.S. Geete	8.....
SubjectExpert.....	2..... Dr. A. Choudhary	9.....
Representative..... (Industry)	3..... Dr. S.G. Mathew	10.....
Representative..... (Alumni)	4.....	11.....
Representative..... (ProfessorScienceFacultyOtherDept.)	5..... (Dr. Veena Kathane)	12.....
	6.....	13.....
	7..... Dr. A.C. Mishra	14.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course-3

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -III		Session:2024-2025
1	Course Code	CZIC/CMIC 301: INDUSTRIAL CHEMISTRY		
2	Course Title	INDUSTRIAL CHEMISTRY: Lab Course-3		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand a number of important organic unit processes. • Become efficient in using standard process instrumentationand transducers for measuring flow control. • Design, execute, record and analysefloats, monographs of raw materials. • To be able analyse various heavy metals Pb, As, Fe and ash content. • Understand polymerization reactions.		
5	Credit Value	1Credit	1 credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks: 50		Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S.No.	List of Experiments
1	UNIT PROCESS: One to two examples of each of the following:- Nitration, Sulphonation, Friedel-crafts reaction, Esterification, Hydrolysis, Oxidation, Halogenation, Chloro-Sulphonation, Reduction,
2	PROCESS INSTRUMENTATION: Transducers of different types, use of Transducers for measuring flow control. Determination of flash point and ignition points of liquids.
3	FLOW MEASURING DEVICES: Floats, Monographs of representative raw materials such as sulphuric acid, toluene, sodium carbonate, sodium hydroxide, carbon tetra chloride, benzoic acid (5-6 compounds).
4	Limit tests for heavy metals Pb, As, Hg, Fe and ash content.
5	Polymerization reaction of diazonium salts.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000). 22
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/18%3A_Chemistry_of_the_Environment
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.
- https://crops.extension.iastate.edu/cropnews/2017/05/economics-soil-health#:~:text=The%20term%20%E2%80%9Ceconomics%20of%20soil,is%20easier%20said%20than%20done.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
SubjectExpert..... (UniversityNominee)	1.....	8.....
SubjectExpert.....	2.....	9.....
Representative..... (Industry)	3.....	10.....
Representative..... (Alumni)	4.....	11.....
Representative..... (ProfessorScienceFacultyOtherDept.)	5.....	
	6.....	
	7.....	

Dr. A.K. Mishra 05/7/24
(Dr. Anju Tha)
(Dr. H. Mohabey)
(Dr. SC. Tiwari)
Dr. Bhawna Jain
(Dr. S.D. Deshmukh)
Dr. V.S. Geete
Dr. A. Kashyap
Dr. S.B. Mathew
(Dr. Prerna Kathane)
Dr. A.K. Pikle

DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25
INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION			
Program: FYUP		**Class: B.Sc. Semester -IV**	**Session:2024-2025**
1	**Course Code**	**CZIC/CMIC 401: INDUSTRIAL CHEMISTRY**	
2	**Course Title**	**Unit processes, Instrumentation and industrial safety**	
3	**Course Type**	**Discipline Specific Core (DSC)/ Generic Elective (GEC)**	
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • CO1: To gain knowledge about hydrogenation reaction, catalysts for hydrogenation, alkylation, alkylating agents, manufacture and mechanism of organic compounds. • CO2: To understand about esterification and hydrolysis reaction, hydrolyzing agents, mechanism of hydrolysis. • CO3: To understand about aminolysis, aminating agents, amination reaction and their mechanism. • CO4: To understand concept of construction, principle and working of temperature and pressure measuring instruments. • CO5: To know about liquid level measurement, density, viscosity filters, precipitators, eliminators, scrubbers, absorbers and industrial safety measures	
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**
6	**Total Marks**	**Maximum Marks :100**	**Minimum Passing Marks:40**

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Hydrogenation:Introduction,mechanismofhydrogenationreactions,catalystsforhydrogenation reactions, hydrogenation of vegetable oil. Manufacture of methanol fromcarbon monoxide and hydrogen, hydrogenation of acid and esters to alcohols, catalyticreforming. Alkylation:Introduction; Types ofalkylation, alkylating agents. Mechanismof alkylation reactions, manufacture of alkyl benzene (for detergent manufacture), ethylbenzene,phenyl ethylalcohol,N-alkylanilines(monoand di methylanilines)	9
II	Esterification:Introduction, hydrodynamics and mechanism of esterification reactions, Esterification byorganic acids, by addition of unsaturated compounds, esterification of carboxy acidderivatives, commercial manufacture of ethyl acetate, dioctyl phthalate, vinyl acetate,celluloseacetate Hydrolysis: Introduction, hydrolyzing agents, mechanismof hydrolysis.	9

III	Amination byreduction: Introduction, methods of reduction-metalandacid,catalytic,sulfide,electrolytic,metal and alkali sulfites,metalhydrides,sodiummetal,concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitroaniline,p-aminophenol. Amination by aminolysis: Introduction, aminating agents, factors affecting aminolysis	9
IV	Process Instrumentation:Concept of measurement and accuracy, principle, construction and working of followingmeasuringinstruments. Temperature:Glass thermometers, bimetallic thermometer, pressure spring thermometer, vapour filledthermometers,resistance thermometers, radiation pyrometers. Pressure: Manometers, barometers, bourdon pressure gauge, bellow type, diaphragm typepressure gauges, Macleodgauges, piranigauges, etc.	9
V	Liquid level: Direct-indirect liquid level measurement, Float type liquid level gauge, ultrasonic level gauges, bubbler system, density measurement, viscosity \measurement. Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers, absorbers, Industrial safety.	9

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

Reference Books

1. Unit process in Organic synthesis P.M. Groggins, McGraw Hill.
2. Industrial Instrumentation, Bekmen, D. P. John Wileys.
3. Applied Instrumentation in process Industries, Vol. I, II & III Andrew, W. G. Gulf Publication.
4. Instrumentation and Control for the process Industries, Borer, S.Elevier Applied Science Publishers.
5. Chemical Engineer's Hand book, Perry, J.H. and Green, D. Mc Graw Hill.

Online Resources:

- https://gpadampur.files.wordpress.com/2015/08/3-2-fcn-practical.pdf
  http://sihfwup.in/content/assets/pdf/CME/Nutritional_Deficiency_Disease_Book.pdf
- https://onlinecourses.swayam2.ac.in/cec20_ag10/preview
- https://onlinecourses.nptel.ac.in/noc23_ag19/preview
- https://archive.nptel.ac.in/courses/103/107/103107088/

(e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B:(Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
SubjectExpert..... (UniversityNominee)	1.....	8.....
SubjectExpert.....	2.....	9.....
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Representative..... (ProfessorScienceFacultyOtherDept.)	5.....	
	6.....	
	7.....	

Dr. A.K. Mishra 05/7/24
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Dr. S.B. Mathew
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Dr. A.K. Jain

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course - 4

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -IV		Session: 2024-2025
1	Course Code	CZIC/CMIC 401		
2	Course Title	INDUSTRIAL CHEMISTRY: Lab Course - 4		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Become efficient in using standard instrumentationmethods of analysis. • Tounderstandaboutdesign, execute, test and analyse materials. • To know about analyse various heavy metals Pb, As, Fe and ash content. • Togainknowledgeaboutwater analysis for industrial specifications.		
5	Credit Value	1 Credit	1 credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks: 50		Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S. No.	List of Experiments
1	INSTRUMENTAL METHODS OF ANALYSIS: Use of colorimeter, pH meter, Potentiometer, Conductometer, Refractometer, Polarimeter.
2	MATERIAL TESTING: Testing of alloys, Identification of plastics/rubber, estimation of yield point, Young's modulus, flaredness; Optical, Thermal, Mechanical and Electrical properties.
3	WATER ANALYSIS: Solid contents, hardness, COD and other tests as per industrial specifications.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. Unit process in Organic synthesis P.M. Groggins, McGraw Hill.
2. Industrial Instrumentation, Bekmen, D. P. John Wileys.
3. Applied Instrumentation in process Industries, Vol. I, II & III Andrew, W. G. Gulf Publication.
4. Instrumentation and Control for the process Industries, Borer, S.Elevier Applied Science Publishers.
5. Chemical Engineer's Hand book, Perry, J.H. and Green, D. Mc Graw Hill.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/18%3A_Chemistry_of_the_Environment
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.
- https://crops.extension.iastate.edu/cropnews/2017/05/economics-soil-health#:~:text=The%20term%20%E2%80%9Ceconomics%20of%20soil,is%20easier%20said%20than%20done.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....	1..... Dr. V.S. Geete	8.....
SubjectExpert..... Dr. A.K. Mishra 05/7/24 (UniversityNominee)	2..... Dr. A. Kadyap	9.....
SubjectExpert..... (Dr. A. Jha) (Dr. H. Mohabey)	3..... Dr. S.B. Mathew	10.....
Representative..... (Industry) (Dr. S.C. Tiwari)	4.....	11.....
Representative..... (Alumni) Dr. Bhawana Jain	5..... 05/7/24 (Dr. Prerna Kalthane)	
Representative..... (ProfessorScienceFacultyOtherDept.) (Dr. S.D. Deshmukh)	6.....	
	7..... Dr. A.V. Patil	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG, (CG)

DEPARTMENT OF CHEMISTRY

Four Year Undergraduate Program
INDUSTRIAL CHEMISTRY
B.Sc. Semester- III & IV

COURSE CURRICULUM
2024-25
DSE

DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION			
Program: FYUP		**Class: B.Sc. Semester -III**	**Session:2024-2025**
1	**Course Code**	**ICSE302: INDUSTRIAL CHEMISTRY**	
2	**Course Title**	**Analytical Methods in Chemistry**	
3	**Course Type**	**Discipline Specific Elective(DSE)**	
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Understand and perform experiment with accuracy and precision. • Explain and develop methods of analysis for different samples independently. • Describe Thermal methods of analysis and treatment process. • Understand the electro analytical methods. • Understand basic principle of UV-vis spectrophotometer and quantitative analysis • Explain the various separation techniques like extraction, chromatography etc.	
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**
6	**Total Marks**	**Maximum Marks :100**	**Minimum Passing Marks:40**

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Qualitative and quantitative aspects of analysis:Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression. Normal law of distribution of indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.	9
II	Optical methods of analysis: Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Transmittance. Absorbance and Beer-Lambert law, Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers.	9
III	Thermal methods of analysis:Theory of thermogravimetry (TG) and basic principle of instrumentation of thermal analyser. Techniques for quantitative estimation of Ca and Mg from their mixture.	9
IV	Electro analytical methods: Classification of electro analytical methods, basic principle of pH metric, potentiometric andconductometric titrations. Techniques used for the determination of equivalence points.	9

V	Separation techniques: Solvent extraction: Classification, principle and efficiency of the technique.Mechanism of extraction: extraction by solvation and chelation, Technique of extraction: batch,continuous and counter current extractions, Qualitative and quantitative aspects of solvent extraction. Chromatography: Classification, principle and efficiency of the technique, Mechanism of separation.	9

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

Reference Books

1. Willard, H.H.(1988),Instrumental Methods of Analysis, 7th Edition, Wardsworth Publishing Company.
2. Christian, G.D.(2004),Analytical Chemistry, 6th Edition, John Wiley & Sons, New York.
3. Harris, D. C.(2007),Quantitative Chemical Analysis,6th Edition, Freeman.
4. Khopkar, S.M. (2008), Basic Concepts of Analytical Chemistry, New Age International Publisher.
5. Skoog, D.A.; Holler F.J.; Nieman, T.A. (2005), Principles of Instrumental Analysis, Thomson Asia Pvt. Ltd.

Online Resources:

- https://gpadampur.files.wordpress.com/2015/08/3-2-fcn-practical.pdf
  http://sihfwup.in/content/assets/pdf/CME/Nutritional_Deficiency_Disease_Book.pdf
- https://onlinecourses.swayam2.ac.in/cec20_ag10/preview
- https://onlinecourses.nptel.ac.in/noc23_ag19/preview
- https://archive.nptel.ac.in/courses/103/107/103107088/

(e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B:(Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
Subject Expert..... (University Nominee)	1.....	8.....
Subject Expert.....	2.....	9.....
Representative..... (Industry)	3.....	10.....
Representative..... (Alumni)	4.....	11.....
Representative..... (Professor Science Faculty Other Dept.)	5.....	
	6.....	
	7.....	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -III		Session:2024-2025
1	Course Code	ICSEL 302		
2	Course Title	INDUSTRIAL CHEMISTRY: Lab Course- 1		
3	Course Type	DSE		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand chromatography and Rf values. • To know about separation technique and able to be separation of mixturebySolvent Extractions. • To be able analyse various contents present in soil. • Understand Spectrophotometric technique.		
5	Credit Value	1 Credit	1 Credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks: 50		Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S. No.	List of Experiments
1	Separation of mixtures by paper chromatography and reporting the Rf values: (i) Ions or dyes mixture (ii) Amino acids present in the given mixture.
2	Solvent Extractions (i) To separate a mixture of Ni2+ & Fe2+ by complexation with DMG and extracting the Ni2+ DMGcomplex in chloroform, and determine its concentration by spectrophotometry.
3	Analysis of soil: (i) Determination of pH of soil. (ii) Total soluble salt (iii) Estimation of calcium and magnesium (iv) Qualitative detection of nitrate and phosphate
4	Spectrophotometry: (i) Verification of Lambert-Beer's law and determination of concentration of a coloured species(CuSO4, KMnO4, K2 Cr2 O7)

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, John Wiley & Sons, Inc. Publishers, New Delhi.(2005 edition).

3. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.

4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.

5. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C.(1989),Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/18%3A_Chemistry_of_the_Environment
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.
- https://crops.extension.iastate.edu/cropnews/2017/05/economics-soil-health#:~:text=The%20term%20%E2%80%9Ceconomics%20of%20soil,is%20easier%20said%20than%20done.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
Subject Expert..... (University Nominee)	1.....	8.....
Subject Expert.....	2.....	9.....
Representative..... (Industry)	3.....	10.....
Representative..... (Alumni)	4.....	11.....
Representative..... (Professor Science Faculty Other Dept.)	5.....	
	6.....	
	7.....	

DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION			
Program: FYUP		Class: B.Sc. Semester -IV	Session:2024-2025
1	Course Code	ICSE402	
2	Course Title	INDUSTRIAL CHEMISTRY:Molecules of Life	
3	Course Type	Discipline Specific Elective (DSE)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand and perform experiment with accuracy and precision. • Explain and develop methods of analysis for different samples independently. • Describe Thermal methods of analysis and treatment process. • Understand the electro analytical methods. • Understand basic principle of UV-vis spectrophotometer and quantitative analysis • Explain the various separation techniques like extraction, chromatography etc.	
5	Credit Value	3 Credits	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Carbohydrates: Classification of carbohydrates, reducing and non-reducing sugars, biological functions, generalproperties and reactions of glucose and fructose, their open chain structure, epimers, utarotation and anomers, reactions of monosaccharides, determination of configuration of glucose (Fischer proof), cyclic structure of glucose. Haworth projections. Cyclic structure of fructose. Linkage between monosaccharides.	9
II	Amino Acids, Peptides and Proteins: Classification of amino acids and biological uses of amino Acids, peptides and proteins. Zwitterion structure, isoelectric point and correlation to acidity and basicity of amino acids. Determination of primary structure of peptides, determination of N-terminal amino acid (by DNFB and Edman method) and C– terminal amino acid (by thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (up to dipeptides) by N-protection (t-butyloxy carbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis, Overview of primary, secondary, tertiary and quaternary structure of proteins,	9

III	Enzymes: Classification of enzymes and their uses (mention Ribozymes). Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, specificity of enzyme action (including stereo specificity), enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and non-competitive inhibition including allosteric inhibition).	**9**
IV	Nucleic Acids :Components of Nucleic acids: Adenine, guanine, thymine, cytosine and uracil (structure only), other components of nucleic acids, nucleosides and nucleotides (nomenclature), structure of polynucleotides. Structure of DNA (Watson-Crick model) and RNA (types of RNA), difference between DNA and RNA, genetic code, biological roles of DNA and RNA: replication, transcription and translation.	**9**
V	Lipids: Introduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega-3 & 6 fatty acids, trans fats, hydrogenation, hydrolysis, acid value, saponification value, iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).	**9**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

Reference Books

1. Finar, I. L. Organic Chemistry (Volume 1 & 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Berg, J. M.; Tymoczko, J. L.; Stryer, L.(2002),Biochemistry, W. H. Freeman

Online Resources:

- https://gpadampur.files.wordpress.com/2015/08/3-2-fcn-practical.pdf
  http://sihfwup.in/content/assets/pdf/CME/Nutritional_Deficiency_Disease_Book.pdf
- https://onlinecourses.swayam2.ac.in/cec20_ag10/preview
- https://onlinecourses.nptel.ac.in/noc23_ag19/preview
- https://archive.nptel.ac.in/courses/103/107/103107088/

(e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B:(Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
SubjectExpert..... (UniversityNominee)	1.....	8.....
SubjectExpert.....	2.....	9.....
Representative..... (Industry)	3.....	10.....
Representative..... (Alumni)	4.....	11.....
Representative..... (Professor ScienceFaculty Other Dept.)	5.....	
	6.....	
	7.....	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course

PART A: INTRODUCTION			
Program: FYUP		Class: B.Sc. Semester -IV	Session:2024-2025
1	Course Code	ICSEL 402	
2	Course Title	Lab Course - 2	
3	Course Type	DSE	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Become efficient in using standard chromatographic methods. • To understand about Qualitative tests. • To know about analyse/ extract DNA from vegetables. • To gain knowledge about estimation of proteins.	
5	Credit Value	1 Credit	1 credit =30 Hours – Learning and Observation
6	Total Marks	Maximum Marks: 50	Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S. No.	List of Experiments
1	Separation of amino acids by paper chromatography
2	Qualitative tests for carbohydrates- Molisch test, Barfoed's reagent test, rapid furfural test, Tollen's test and Fehling solution test
3	To determine the iodine value of an oil/fat
4	Effect of temperature on the action of salivary amylase on starch.
5	To determine the saponification value of an oil/fat.
6	Extraction of DNA from onion/cauliflower
7	Study of titration curve of glycine and determination of its isoelectric point.
8	Estimation of proteins by Lowry's method. Action of salivary amylase on starch.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

Reference Books:

1. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. (2012), Vogel's Textbook of Practical Organic Chemistry, Pearson.
2. Seiler, J.P. (2005). Good Laboratory Practices: the why and how. Springer-Verlag Berlin and Heidelberg GmbH & Co. K; 2nd ed.
3. Garner, W.Y., Barge M.S., Ussary. P.J. (1992). Good Laboratory Practice Standards: Application for field and Laboratory studies. Wiley VCH.

Online Resources: (e- Resources/ e-Books/ e- Learning Portals)

- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/18%3A_Chemistry_of_the_Environment
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
SubjectExpert..... Dr. AK. Mishra 05/7/24 (UniversityNominee)	1..... Dr. VS. Geete	8.....
SubjectExpert..... Dr. A Jha	2..... Dr. A. Kavlyan	9.....
Representative..... (Dr. S.C. Tiwari) (Dr. H. Mahabey) (Industry)	3..... Dr. S.B. Mathew	10.....
Representative..... Dr. Bhawna Jain (Alumni)	4.....	11.....
Representative..... 5/7/24 (Professor Science Faculty Other Dept.)	5..... (Dr. Prerna Kalthane)	
	6.....	
	7..... M.A.U. Khan	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG, (CG)

DEPARTMENT OF CHEMISTRY

FOUR YEAR UNDERGRADUATE PROGRAM

B. Sc. SEMESTER– V & VI

INDUSTRIAL CHEMISTRY

COURSE CURRICULUM

DSC/ GEC

2024-25

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG, (CG)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION			
Program: FYUP		Class: B.Sc. Semester - V	Session:2024-2025
1	Course Code	CZIC/CMIC 501	
2	Course Title	INDUSTRIAL ECONOMICS	
3	Course Type	Discipline Specific Course (DSC)/Generic Specific Course(GEC)	
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** • CO:1 To gain knowledge of the process of estimating the cost sassociated with completing a project within scope and according to its timeline. • CO:2 To understand about various resources for fixed assets and land and gain knowledge regarding start-up. • CO:3 To determining the real value of assets and fixing right price for products. • CO:4 To deal with controlling and regulating the flow of material in relation to changes in variables like demand, prices, availability, quality, delivery schedules etc. • CO:5 To learn about management skills and become efficient managers.	
5	Credit Value	3 Credits	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :75	Minimum Passing Marks:30

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Factors involved in project cost estimation, methods employed for the estimation of capital investment. Capital formation, elements of cost accounting.	9
II	Interest & investment cost, time value of money equivalence. Depreciation, method of determining depreciation, taxes. Some aspects of marketing, pricing policy.	10
III	Profitability criteria, economics of selecting alternatives Break - even point, optimum batch sizes, Production, scheduling etc. Collection & processing data.	10

IV	Industrial Organization, Conceptofscientificmanagementin industry. Functions of management, decision making, planning, organizing. Locationof industry.	8
V	Materials management. Inventory control. Management of human resources - Selection, incentives, Welfare & safety.	8

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

Text Books Recommended –

1. IndustrialOrganization&Management,Bethal,L.L.
2. IndustrialOrganization&Management,Tarachand,Vol.I&II.
3. BookonManagement,Khandelwal, O.P.
4. RheologyTheory&Application,Vol, 5, Elrich ,R.F.
5. EconomicsofChemicalIndustry,Hempel,E.H.
6. PlantDesign&Economicsfor Chemical Engineers,PeterTimeRhaus,McGrawHill.
7. I.C.M.A.Booklets-9&10

Online Resources–

- e-Resources / e-books and e-learning portals
- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/18%3A_Chemistry_of_the_Environment
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.
- https://crops.extension.iastate.edu/cropnews/2017/05/economics-soil-health#:~:text=The%20term%20%E2%80%9Ceconomics%20of%20soil,is%20easier%20said%20than%20done.

Online Resources–: e-Resources / e-books and e-learning portals.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:	
Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**60 Marks**
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks
Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B: (Compulsory) Very short answer type (01 each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question - D: Long answer type question 07 x 5 = 35 Marks **Total = 60 Marks**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
SubjectExpert..... Dr. A.K. Mishra 05/7/24	Dr. A. K. Dikshit
(University Nominee)	Dr. V.S. Geete
Subject Expert..... (Dr. H. Mohabey)	Dr. A. Kashyap
Subject Expert..... (Dr. S.C. Tiwari)	(Dr. Prerna Kathane)
(Dr. A. Jha)	Dr. S. B. Mathew
Representative.....	
(Industry)Representative.....	
(Alumni)	
Representative..... 5/7/24	
(ProfessorScienceFacultyOtherDept.)	
(Dr. S.D. Deshmukh)	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course-5

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -V		Session:2024-2025
1	Course Code	CZIC/CMIC 501		
2	Course Title	INDUSTRIAL CHEMISTRY Lab Course: 05		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Synthesise a number of important organic compounds/chemicals. • Become efficient in using standard operating procedures and will be well versed with the regulations for safe handling and use of chemicals. • Analyse various components of the raw materials and finished products • Design, execute, record and analyse the results of chemical experiments • Undertake hands on lab work and practical activities and develop problem solving abilities required for successful career in chemical industries, teaching, research, environmental monitoring, product quality, food products, cosmetic industries, oils and lubricants industries, petrochemicals etc.		
5	Credit Value	1 Credit	1 credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

PART B: CONTENT OF THE COURSE

S. No.	List of Experiments
1	Synthesis of common industrial compounds involving two-step reactions. -bromoaniline,3-Nitroaniline,Sulphanilamide,4-Aminobenzoicacid, -Nitrobenzoicacid, di-halobenzenes, Nitro halobenzenes.
2	Industrial analysis of common raw materials as per industrial specification:Phenol,Aniline,Formaldehyde,Hydrogenperoxide,Acetone,E poxide, Olefins, oils etc.
3	Spectrophotometricestimationofdrugs–ciprofloxacin,paracetamol,etc.
4	Preparation of pharmaceutical formulations like cream, suspension and emulsions.

5	Determinationofsaponificationvalueofoil/polymericmaterials.
6	Determinationofiodinevalueofoil/polymericmaterials.
7	Quantitativeanalysisofjewellery.
8	Determinationofashcontent inpolymericsubstance.
9	Microbiological testing determination of mic of some antibacterial drugs by zone /cupplate method.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS RECOMMENDED:

- Rattenburry, Evelyn M. Introductory Titrimetric and gravimetric analysis.
- Vogel A.I., TextBookofQualitativeInorganicAnalysis, IIIedition(1976).
- Singh A.K. Singh A.K., Computer "C" Programming, Concept principle and program.
- Scott P.W. Techniques and Practice of Chromatography

Online Resources:

- http://nptel.ac.in
- http://swayam.gov.in
- http://epathshala.nic.in.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 25 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Department (LOCF)**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
Subject Expert..... Dr A.K. Mishra 05/7/24	Dr. A.K. Alam Dr. V.S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mohabey	Dr A. Kanlyap
Subject Expert..... (Dr. A. Jha) (Dr. S.C. Tiwari)	05/7/24 (Dr. Prerna Kathane)
Representative..... B. Jaiswal	05/07/24. (Dr. Sunitha B. Mathew)
(Industry)Representative.....	
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.)	

DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION			
Program: FYUP		Class: B.Sc. Semester -VI	Session:2024-2025
1	Course Code	CZIC/CMIC 601	
2	Course Title	PHARMACEUTICALS	
3	Course Type	Discipline Specific Course (DSC)/ Generic Specific Course(GEC)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • To correlate and compare historical background/development of Indian and other important pharmacopoeias and understand formulations/routes of administration/aseptic conditions and sterilization in pharmaceuticals. • To describe the manufacture and quality specifications of pharmaceutical excipients/additives and applications of sutures, ligatures in surgical dressing. • To acquaint with the packaging/ancillary materials, machinery and important legal aspects of food and drug industry. • To learn classification of crude drugs, collection, manufacture and storage of sulpha drugs. • To understand fundamentals and applications of various chromatographic techniques like paper HPLC,GLC,TLC,column for evaluation/identification of crude drugs.	
5	Credit Value	3 Credits	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :75	Minimum Passing Marks:30

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. ofPeriods
I	Historical background &development of pharmaceutical industry in brief. Pharmacopoeias:-Development of Indian pharmacopoeia & introduction of B.P., U.S.P., E.P., N.F & other important pharmacopoeias. Introduction to various types of formulations & routes of administration. Aseptic conditions, need for sterilization, various methods of sterilization.	9

II	Various types of pharmaceutical excipients, their chemistry, process of manufacture & quality specifications. Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents, gelatin an dotheradditives, sorbitol, mannitol, viscosity builders etc. Surgical dressing, sutures, ligatures with respect to the process, equipment used formanufacture.	**9**
III	Pharmaceuticalpackagingintroduction,packageselection, packagingmaterials,ancillarymaterials,packagingmachinery, qualitycontrol ofpackaging materials. F.D.A.Importantschedules&somelegalaspectsof drugs. Pharmaceuticalqualitycontrol(otherthananalyticalmethodscov eredundercoresubject) sterilitytesting, pyrogenictesting,glass testing,bulkdensityofpowder etc.	**9**
IV	Phytochemicals - Introduction to plant classification & crude, drugs, cultivation, collection, preparations for the market &storage of medicinal plants. Classification of various types of drugs with examples. Raw materials, process of manufacture, effluent handling, etc of the followingbulk drugs: Sulpha drugs - sulphaguanidine.	**9**
V	Evaluation of crude drugs-Moisture content, extractive value, volatile oil content, introduction to chromatographic method for identificationof crude drugs. Chromatography: Paper chromatography, TLC, HPLC, GLC.	**9**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

Text BooksRecommended:–

- Trivedy, R. K., & Raman, N. S. (2002). Industrial Pollution and Environmental Management. Scientific Publishers.
- Brusseau, M. L., Pepper, I. L., & Gerba, C. P. (2019). The Extent Of Global Pollution. In Environmental and Pollution Science (Pp. 3-8). Academic Press.
- Rathore, H. S., &Nollet, L. M. (Eds.). (2012). Pesticides: Evaluation Of Environmental Pollution. CRC Press.
- Rad, P. F. (2001). Project Estimating and Cost Management. Berrett-Koehler Publishers.
- Sharma, B. K. (2000). Industrial Chemistry (Including Chemical Engineering). Goel Publishing House.
- Mahajan, (2010). Environmental Chemistry. New Delhi: S Chand & Company Ltd.
- De, A. K. (2003). Environmental Chemistry. New Delhi: New Age International.

Reference Books:

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- https://nptel.ac.in/courses/126105016
- https://nptel.ac.in/courses/105103205
- https://nptel.ac.in/courses/126105010
- https://nptel.ac.in/courses/105/102/105102089/
- https://nptel.ac.in/courses/122/106/122106030/
- https://nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf

Online Resources–

- e-Resources / e-books and e-learning portals.

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit**	
	Question -A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10
	Marks Question - C: Short answer type question	03 x 5 = 15
	Marks	
	Question - D: Long answer type question	07 x 5 = 35
	Marks	
	Total = 60 Marks	

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....

Subject Expert..... Dr. A.K. Mishra 05/7/24

(University Nominee)

Subject Expert..... Dr. H. Mohabey H. Mohabey

Subject Expert..... (Dr. A. Jha) (Dr. S.C. Tiwari)

Representative.....

(Industry)Representative.....

(Alumni)

Representative..... 5/7/24

(Professor Science Faculty Other Dept.)

(Dr. S.D. Deshmukh)

Departmental members:

Dr. A.K. Mishra Dr. V.S. Geete

Dr. A. Kashyap

(Dr. Prerna Kathane)

Dr. S.B. Mathew

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25
INDUSTRIAL CHEMISTRY: Lab Course-6

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc.	Semester -VI	Session:2024-2025
1	Course Code	CZIC/CMIC 601		
2	Course Title	INDUSTRIAL CHEMISTRY Lab Course- 6		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** • Describe pharmaceutical industry and identify the distinguishing features of its components like packaging and storage, quality control etc. • Identify appropriate resources required for an assigned task/project to accomplish it. • Identify various pharmaceutical products. • To evaluate raw materials and communicate the results of their work to chemists and non-chemists • To evaluate finished products and communicate the results to the chemists. Evaluate crude drugs • Undertake hands on lab work and practical activities and develop problem solving abilities required for successful career in pharmaceuticals industries, teaching, research, environmental monitoring, product quality etc.		
5	Credit Value	1 Credit	1 Credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

PART B: CONTENT OF THE COURSE	
S. No.	List of Experiments
1	Demonstration of various pharmaceutical packaging materials, quality control tests of some materials, Strips, Cartons, Glass bottles.
2	Evaluation of crude drugs - macroscopic examination, determination & identification of starch granules, calcium oxalate.
3	Limit tests for chlorine, heavy metals, arsenic, etc. of two representative bulk drug.
4	Demonstration of various pharmaceutical products.
5	Active ingredient analysis of few types of formulations representing different methods of analysis -acidimetry, alkalimetry, non-aqueous
6	Determination of sulphate ash, loss of drying & other tests of bulk drugs, complete IP monograph of the drugs representing variety of testing methods.

7	Palisade ratio, stomatal index -determination and identification of few drugs, TLC method for identification.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

Text Books Recommended:

1. Instrumental methods of analysis, Willard, Merit, Dean.
2. Introductiontoinstrumental methodsof analysis,Braun,R.D.McGrawHill.
3. Analyticalchemistry, J.B.Dick,McGraw.Hill.
4. QuantitativeInorganicanalysis,A.Vogel.
5. Instrumentalmethodsofanalysis,Skoog&West.
6. Instrumentalmethodsofanalysis,B.K.Sharma.
7. PracticalPharmacognosy,T.B.Wills
8. PracticalPharmacognosy,T.N.Vasudevan
9. Modern Pharmacognosy Remstad, McGraw Hill
10. IndianPharmacopoiea,1985
11. BritishPharmacopoiea,1990
12. HandBookof DrugsandCosmeticAct.,Mehrotra

Online Resources: –

- e-Resources / e-books and e-learning portals
- https://ncert.nic.in/textbook/pdf/kech207.pdf
- https://archive.nptel.ac.in/courses/122/106/122106030/
- https://www.ncbi.nlm.nih.gov/books/NBK83730/
- https://byjus.com/chemistry/environmental-chemistry/
- https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qal1-certification-for-so2/60799.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 25 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
Subject Expert..... Dr. A. K. Mishra 05/7/24	Dr. V. S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mahabey	Dr. A. Kulkarni
Subject Expert..... (Dr. A. Jha) (Dr. S. C. Tiwari)	(Dr. Prerna Kathane)
Representative..... B. Jain	
(Industry)Representative.....	Dr. S. B. Mathew
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.) (Dr. S. D. Deshmukh)	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG (CG)

DEPARTMENT OF CHEMISTRY

Four Year Undergraduate Program
INDUSTRIAL CHEMISTRY
Semester V& VI

Session
2024-25
DSE

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -V		Session:2024-2025
1	Course Code	CZICE/CMICE 503		
2	Course Title	Data Analysis and Separation Techniques		
3	Course Type	Discipline Specific Elective (DSE)		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • To learn the data analysis, significant figure and error. • To learn Chromatographic separation techniques. • To learn the purification technique of chemical compound. • To learn the computer program useful in industrial chemistry		
5	Credit Value	3Credits	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :75		Minimum Passing Marks:30

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Data analysis, theory of errors, idea of significant figures and its importance with examples, precision, accuracy, methods of expressing accuracy. Error analysis, minimizing errors, method of expressing precision, average deviation, standard deviation and confidence limit.	9
II	Purification of solid organic compounds: extraction, use of immiscible solvents, soxhlet extraction, crystallization, use of miscible solvents, fractional crystallization, sublimation. Purification of liquids, experimental techniques of distillation, fractional distillation, vacuum distillation, steam distillation, tests for purity.	9
III	Chromatography- principles and techniques of column, paper and thin layer chromatography-Rf value- applications. Ion exchange chromatography-principle-experimental techniques and applications. HPLC and GC-Principle, instrumentation and applications GC-MS and LC-MS-Principle, instrumentation and applications	9
IV	Introduction to computer and its application in chemistry – characteristics of a computer – types of computer – block diagram of a digital computer – the art of programming – general features of a programming language – algorithm and flow charts.	9

V	Introduction to C, structure of a C program, character set of C data types , identifiers, reserved words, variables, constants, keywords, escape sequence, type conversion C operation (basic aspects only). Application of computer in chemistry, determination of molarity, normality and molality of solutions, calculation of pH.	9

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. Gopalan, R., Subramanian, P. S., & Rengarajan, K. (1997). Elements of analytical chemistry. New Delhi, India: S. Chand and Sons.
2. Chatwal, A. (2000). Instrumental methods of chemical analysis. New Delhi, India: Anand-Himalaya Publishing House.
3. de la Vie, R. (1997). A spreadsheet workbook for quantitative chemical analysis. New Delhi, India: McGraw-Hill, Inc.
4. Raman, K. V. (1993). Computers in chemistry. New Delhi, India: Tata McGraw-Hill Ltd.
5. Srivastava, V. K., & Srivastava, K. K. (1991). Introduction to chromatography. S. Chand and Sons.

Online Resources–

- http://nptel.ac.in
- http://swayam.gov.in
- http://epathshala.nic.in

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15Marks**
Semester End Exam (SEE):	**60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test of 15 Marks andAssignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question A & B(Compulsory)Very short answer type(1each)02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 60 Marks**

Name &Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
Subject Expert..... Dr. A.K. Mishra 05/7/24	Dr. A. K. Bilimi Dr. V.S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mohabey	Dr. A. Kashyap
Subject Expert..... (Dr. A. Jha) (Dr. S.C. Tiwari)	05/7/24 (Dr. Prerna Rathane)
Representative..... B. Jain	Dr. Sunitha B. Mathew
(Industry)Representative..... Dr. Bhavana Jain	
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.) (Dr. S.D. Deshmukh)	

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FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course- 3

PART A: INTRODUCTION				
Program: FYUP		**Class: B.Sc.**	**Semester -V**	**Session:2024-2025**
1	**Course Code**	**CZICE/CMICE 503**		
2	**Course Title**	**Industrial Chemistry: Lab Course-3**		
3	**Course Type**	**DSE**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • To learn the data analysis, significant figure and error. • To learn Chromatographic separation techniques. • To learn the purification technique of chemical compound. • To learn the computer program useful in industrial chemistry.		
5	**Credit Value**	**1Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :25**		**Minimum Passing Marks:10**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments**
1	Gravimetric estimation a. Estimation of sulphate as barium sulphate. b. Estimation of barium as barium sulphate. c. Estimation of barium as barium chromate. d. Estimation of lead as lead chromate.
2	Principles involved in chromatographic separation: Paper Chromatography, Column Chromatography TLC: Separation of following metal ions: (a) Ni(II), and Co(II) (b)Fe(III) And Al(III).
3	Volumetric analysis: (i)Determination of commercial vinegar in acetic acid.
4	(ii) Estimation of ferrous and ferric by dichromate method
5	(iii)Estimation of Copper using thiosulphate Programming
6	Making and running the program

PART C - LEARNING RESOURCES
Text Books, Reference Books, Other Resources
Text Books Recommended – ➢ Rattenburry, Evelyn M. Introductory Titrimetric and gravimetric analysis. ➢ Vogel A.I., TextBookofQualitativeInorganicAnalysis, IIIedition(1976). ➢ Singh A.K. Singh A.K., Computer "C" Programming, Concept principle and program. ➢ Scott P.W. Techniques and Practice of Chromatography. **Online Resources:** ➢ http://nptel.ac.in ➢ http://swayam.gov.in ➢ http://epathshala.nic.in **Online Resources:** ➢ **(e- Resources/ e- Books/ e- Learning Portals)**

PART D: ASSESSMENT AND EVALUATION	
Suggested Continuous Evaluation Methods: **Maximum Marks: 25 Marks** **(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)**	
Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D……	Departmental members:
Dr. A.K. Mishra 05/7/24 SubjectExpert……	Dr. A.K. Pillai Dr. V.S. Geete
(University Nominee)	
Dr. H. Mohabey Subject Expert……	Dr. A. Kalgaonkar
Subject Expert…… (Dr. A. Jha) (Dr. S.C. Tiwari)	05/7/24 Dr. Prerna Kathane
Representative…… (Industry)Representative……	Dr. S.B. Mathew
(Alumni) Representative…… (ProfessorScienceFacultyOtherDept.) (Dr. S.D. Deshmukh)	5/7/24

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY

PART A: INTRODUCTION				
	Program: FYUP	**Class: B.Sc. Semester -VI**		**Session:2024-2025**
1	**Course Code**	**CZICE/CMICE 603**		
2	**Course Title**	**Inorganic Materials of Industrial importance**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • To address the student about the inorganic materials which is important in industries. • To understand the preparation, type and use of silicates. • To understand the types of fertilizer as inorganic compound. • To understand the alloy formation and batteries in industries		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :75**		**Minimum Passing Marks:30**

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.	9
II	Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes, carbon nanotubes and carbon fibre.	9
III	Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.	9
IV	Alloys: Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.	9

V	Batteries: Primary and secondary batteries, battery components and their role, Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.	9

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
3. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
4. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
5. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
6. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas
7. Publications, New Delhi.
8. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Online Resources–

- http://nptel.ac.in
- http://swayam.gov.in
- http://epathshala.nic.in

Online Resources:

(e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit** Question - A & B: (Compulsory) Very short answer type (01 each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question - D: Long answer type question 07 x 5 = 35 Marks **Total = 60 Marks**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
Subject Expert..... Dr. A.K. Mishra 05/7/2024	Dr. A.K.P. Deo Dr. V.S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mahabeer	Dr. A. Kalyap
Subject Expert..... (Dr A Jha) (Dr S.C. Thawre)	
Representative..... Dr. Bhadane (Dr. Prerna Kathane) 05/7/24	
(Industry)Representative.....	Dr. S. B. Mathew
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.) (Dr. S.D. Deshmukh)	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

INDUSTRIAL CHEMISTRY: Lab Course- 4

PART A: INTRODUCTION				
Program: FYUP		Class: B.Sc. Semester -VI		Session:2024-2025
1	Course Code	CZICE/CMICE 603		
2	Course Title	INDUSTRIAL CHEMISTRY: Lab Course- 4		
3	Course Type	DSE		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • To learn the analysis of components of fertilizers. • To learn the analysis of alloy • To perform the sample analysis of ore to find the metal percentage. • To demonstrate the metallic coating on ceramics.		
5	Credit Value	1 Credit	1 credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

PART B: CONTENT OF THE COURSE	
S. No.	List of Experiments
1	Determination of free acidity in ammonium sulphate fertilizer.
2	Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3	Estimation of phosphoric acid in superphosphate fertilizer.
4	Electroless metallic coatings on ceramic and plastic material.
5	. Preparation of pigment (zinc oxide).
6	Determination of percentage of metal in alloy.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

Text Books Recommended –

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley
3. Publishers, New Delhi.
4. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley
5. Publishers, New Delhi.
6. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
7. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
8. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, VikasPublications, New Delhi.
9. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Online Resources:

- □ http://nptel.ac.in
- □ http://swayam.gov.in
- □ http://epathshala.nic.in
- **Online Resources:**
- **(e- Resources/ e- Books/ e- Learning Portals)**

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **25 Marks**

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
SubjectExpert..... Dr A.K. Mishra 05/7/24	Dr. U.S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mohabey	Dr. A. Kanlyap
Subject Expert..... (Dr. A. Jha) (Dr. S.C. Tiwari)	(Dr. Preema Kathane)
	05/07/ Dr. Sunitha B. Mathew
Representative.....	
(Industry)Representative.....	
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.)	

B.Sc. (INDUSTRIAL CHEMISTRY)

2024-25

Skill Enhancement Course – 01

ICSEC 01: BASIC PRINCIPLES AND LABORATORY OPERATIONS

THEORY AND PRACTICAL

[Credits -02 (Th-01, 15 hrs.; Practical-01, 30 hrs.)]

Course outcome:

After completing the course students will be able to:

CO1: Understand the use of analytical equipment in industrial chemistry.

CO2: Interpret types of errors in chemical analysis

CO3: Understand Significant figures, absolute and relative uncertainty

CO4: Understand the safety with chemicals and waste.

THEORY:

Laboratory Operations:

Description and use of common laboratory apparatus: Volumetric flasks, burettes, Pipettes, meniscusreaders, weighing bottles, different types of funnels, chromatographic columns, chromatographic jars,desiccators, drying ovens, filter crucibles, rubber policeman.

Calibration and use of volumetric glass ware.

pH meter: components of pH meter, use of pH meter, maintenance of pH meter,application of dataLaboratory notebook.

Errors in Chemical Analysis:

Types of errors

Accuracy and Precision, Significant figures, Absolute and relative uncertainty, propagation of uncertainty.The Gaussian distribution, mean and standard deviation, confidence intervals.

Calibration curve.

Safety with chemicals and waste.

PRACTICAL:

1. Use and calibration of volumetric equipments (volumetric flasks, pipettes and burettes).
2. Preparation of standard solutions of acids and bases.

3. Estimation of sodium carbonate by titrating with hydrochloric acid
4. Preparation of standard solution of EDTA
5. Estimation of magnesium using EDTA
6. Determination of total hardness of water,
7. Use of pH meter: determination of pH of given dilute solutions of shampoos and soaps

Case study/Project

Case study/Project on laboratory Operations, Rules of lab safety with chemicals and waste.

Recommended Books/References:

1. Higson, S. P.J. (2003),Analytical Chemistry, Oxford University Press.
2. Skoog, D.A.; West, D.M. (2003), Fundamentals of Analytical Chemistry, Brooks/Cole.
3. Christian, G.D.(2004), Analytical Chemistry, 6th Edition, John Wiley & Sons, New York.
4. Fifield,F.W.; Kealey, D. (2000), Principles and Practice of Analytical Chemistry, Wiley.
5. Dean J. A. (1997), Analytical Chemistry Handbook, McGraw Hill.
6. Day. R. A.; Underwood, A. L. (1991), Quantitative Analysis, Prentice Hall of India.
7. Gordus, A. A. (1985), Schaum's Outline of Analytical Chemistry, Tala McGraw-Hill.
8. Harris, D. C. (2007), Exploring Chemical Analysis, W.H. Freeman and Co.

Distribution of Marks

Total Marks: Theory - 25 marks and **Practical/Project - 25** marks

Pattern of Examination: Out of 10, five questions to be attempted

(Question Paper pattern and Weightage of marks of internal examinations (if any) will be included as per guidelines of CGHE/University/Autonomous Examination Cell for the particular Academic Session)

The course curriculum of the Skill Enhancement Courses for B.Sc. (Industrial Chemistry) is hereby approved for the Session 2024-25.

Name & Signature of Members of Board of Studies

	Departmentalmembers	
Chairperson/H.O.D.....		
Subject Expert..... (University Nominee)	1.....	8.....
Subject Expert.....	2.....	9.....
Representative.....	3.....	10.....
(Industry)	4.....	11.....
Representative.....	5.....	
(Alumni)	6.....	
Representative.....	7.....	
(Professor Science Faculty Other Dept.)		

B.Sc. (INDUSTRIAL CHEMISTRY)

2024-25

Skill Enhancement Course – 02

ICSEC 02: INSTRUMENTAL METHODS OF ANALYSIS

THEORY AND PRACTICAL

[Credits -02 (Th-01, 15 hrs.; Practical-01, 30 hrs.)]

Course outcome:

After completing the course students will be able to:

CO1: Understand the different types of spectroscopic methods of analysis.

CO2: Understand the instrumentation and applications of the UV- Visible, Atomic spectrometry

THEORY:

UV- Visible Spectrophotometry:

An introduction to Spectroscopic Methods of Analysis

Principle, Lambert-Beer's law

Instrumentation, Single/double beam instrument

Applications: Effect of solvent on λmax , Effect of cis-trans geometrical isomerism (e.g. stillbene),calculation λ max of different compounds (Woodward-Fieser Rule and Schott's Rule) and calculation of stoichiometric ratios of metal-ligand complex (Job's method)

Atomic Spectroscopy:

A. Types

B. Atomizer

C. Instrumentation, Atomic absorption and emission

D. Applications

PRACTICAL:

1. Verification of Lambert-Beer's law using UV-Vis spectrophotometer for CuSO4 solution.
2. Determination of the pKa of an indicator (phenolphthalein) using spectrophotometer.
3. To determine isoelectric pH of a protein.

4. Identification of structure of simple organic compounds using IR- spectroscopy (IR spectra should be provided).
5. Synthesis of acetanilide and its characterisation using 1H NMR and IR spectroscopy.
6. Synthesis of *m*-dinitro benzene and its characterisation using 1H NMR and IR spectroscopy.
7. Isolation of DNA from onion and its characterisation using UV spectroscopy.

Case study/Project

Case study/Project on Spectrophotometry, Presentations by individual student.

Recommended Books/References:

1. Kemp, W. (1991), Organic Spectroscopy, PalgraveMacmillan.

2. Dyer, J.R.(1978),Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall.
3. Banwell, C.N. (2006),Fundamentals of Molecular Spectroscopy,Tata McGraw-Hill Education.
4. Smith, B.C. (1998), Infrared Spectral Interpretations: A Systematic Approach, CRC Press.
5. Atkins, P.; Paula, J.de.(2016), Elements of Physical Chemistry, Oxford University Press.

Distribution of Marks

Total Marks: Theory - 25 marks and **Practical/Project - 25** marks

Pattern of Examination: Out of 10, five questions to be attempted

(Question Paper pattern and Weightage of marks of internal examinations (if any) will be included as per guidelines of CGHE/University/Autonomous Examination Cell for the particular Academic Session)

The course curriculum of the Skill Enhancement Courses for B.Sc. (Industrial Chemistry) is hereby approved for the Session 2024-25.

Name & Signature of Members of Board of Studies

Chairperson/H.O.D.....	Departmental members:
Subject Expert..... Dr. A.K. Mishra 05/7/24	Dr. V.S. Geete
(University Nominee)	
Subject Expert..... Dr. H. Mohabey H. Mohabey	Dr. A. Kaelyap
Subject Expert..... (Dr. A. Jha) (Dr. S.C. Tiwari)	
Representative..... B. Jain	05/7/24 (Dr. Preema Kothane)
(Industry)Representative.....	Dr. Sunitha B. Mathew
(Alumni)	
Representative..... 5/7/24	
(Professor Science Faculty Other Dept.)	

B.Sc. (INDUSTRIAL CHEMISTRY)
2024-25
Skill Enhancement Course – 03
ICSEC 03: DRUGS AND PHARMACEUTICAL CHEMISTRY

THEORY AND PRACTICAL

[Credits -02 (Th-01, 15 hrs.; Practical-01, 30 hrs.)]

Course outcome:

After completing the course students will be able to:

CO1: To get an introductory idea of Antimicrobial, Analgesic Barbiturates Blockers and Cardio vascular drugs.

CO2: To understand the structure, function, deficiency disease caused by steroidal hormones and vitamins.

CO3: To know about fermentation process and product processing.

CO4: To gain insight into manufacture of antibiotics.

THEORY:

Drugs and Pharmaceuticals

Synthesis of the representative drugs of the following classes:
Antimicrobial: Chloramphenicol, Furazolidne, Mercurochrome, isoniazid, Na-PAS.Analgesic – analgesics agents, antipyretic agents.
Anti lnflammatory: Salicylic acid and its derivatives, lbuprofen, Mefenamic acid.Steroidal Hormones: Progesterone, Testosterone, Methyl testosterone. Cardio vascular Agent – Methyldopa, Antihistamins- Chloropheneraminemelate

Fermentation

Products based on fermentation processes: Brief idea of microorganisms, their structure, growth & usefulness. Enzyme systems useful for transformation, microbial products.General principles of fermentation processes & product processing.Manufacture of antibiotics- Penicillin-G &semi synthetic penicillin, Rifamycin, Vitamin-B12. Biotransformation process for prednisolone, 11-hydroxylation insteroids.

PRACTICAL:

1. Synthesis of common industrial compounds involving two-step reactions.
   4 -bromoaniline,3-Nitroaniline,Sulphanilamide,4-Aminobenzoicacid,
   5 --Nitrobenzoicacid, dihalobenzenes, Nitrohalobenzenes.
2. Industrial analysis of common raw materials as per industrial specification: Phenol, Aniline, Formaldehyde, Hydrogenperoxide ,Acetone, Epoxide, Olefins, oils etc.

3. Demonstration of various pharmaceutical packaging materials, quality control tests of some materials, -A1 Strips, Cartons, Glass bottles.
4. Limit tests for chlorine, heavy metals, arsenic etc. of two representative bulkdrug.
5. Demonstration of various pharmaceutical products.
6. Active ingredient analysis of few types of formulations representing different methods of analysis -acidimetry, alkalimetry, non-aqueous.
7. Determination of sulphate ash, loss of drying & other tests of bulk drugs, complete IP monograph of three drugs representing variety of testing methods.
8. Evaluation of crude drugs - macroscopic examination, determination & identification of starch granules, calcium oxalate.
9. Preparation of pharmaceutical formulations like cream, suspension and emulsions.

Case study/Project

Case study/Project on Spectrophotometry, Presentations by individual student

Recommended Books/References:

1. Practical Pharmacognosy, T. B. Wills
2. Practical Pharmacognosy, T. N. Vasudevan
3. Modern Pharmacognosy Remstad, McGraw Hill
4. IndianPharmacopoea,1985
5. BritishPharmacopoea,1990
6. HandBookof DrugsandCosmeticAct.,Mehrotra
7. Principles of Medicinal Chemistry, W.O. Foye, Lea & Febigen, Publication, Philedelphia.
8. Essentials of Medicinal Chemistry, Korolkovas & Burkhatter, Wiley Inter science.
9. Text book of Organic Medicinal and Pharmaceutical Chemistry, Wilson, Gisvold, Derge, Lippinett-Toppan.

Distribution of Marks

Total Marks: Theory - 25 marks and **Practical/Project - 25** marks

Pattern of Examination: Out of 10, five questions to be attempted

(Question Paper pattern and Weightage of marks of internal examinations (if any) will be included as per guidelines of CGHE/University/Autonomous Examination Cell for the particular Academic Session)

The course curriculum of the Skill Enhancement Courses for B.Sc. (Industrial Chemistry) is hereby approved for the Session 2024-25.

Distribution of Marks

Total Marks: 25 (80% End Semester Exam and 20% Internal Assessment)
Internal assessment – Assignment of 25 marks, Out of 10, five questions to be attempted

(Weightage of marks internal examinations will be included and Question Paper pattern as per guidelines of Autonomous Examination Cell)

The revised syllabus for B.Sc. (Industrial Chemistry) Semester III & IV is hereby approved for the Session 2023-24

NAME AND SIGNATURE:

Chairperson /H.O.D	Departmental members:
Subject Expert ..... Dr. A.K. Mishra 05/7/24	
(University Nominee)	
Subject Expert..... Dr. A. Jha	
Representative..... (Dr. H. Mohabey) (Dr. SC. Tiwari)	(Dr. P. Kathane)
(Industry)	
Representative.....	Dr. A. Kashyap
(Alumni)	Dr. S. B. Mathew
Representative 5/7/24	
(Professor Science Faculty Other Dept.)	