

**SYLLABUS FOR  
THE FOUR-YEAR UNDERGRADUATE PROGRAMME  
(FYUGP)**

**SESSION 2024-25**



**INDUSTRIAL CHEMISTRY**

**SEMESTER I - VI**

**GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE,  
RAJNANDGAON (C.G.)**

**GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)**  
**FYUGP (CBCS/LOCF Course)**  
**Department-CHEMISTRY**  
**B. SC. (Multiple Major) - DIPLOMA COURSE (session 2024-25)**  
**Major-INDUSTRIAL CHEMISTRY**

Session:2024-25	Program: B.Sc.
Semester: III	Subject: INDUSTRIAL CHEMISTRY
Course Type: DSC	Course Code:
Course Title:	: MATERIAL SCIENCE AND ENVIRONMENTAL STUDIES
Credit : 4	Lecture: 60
M.M. 100 = (ESE 80 + IA 20)	Minimum Passing Marks: 40%

Title	MATERIAL SCIENCE AND ENVIRONMENTAL STUDIES
Course Learning Outcome:	(i) Student will learn about manufacturing of cement and ceramics (ii) Student will learn about polymer and composite material. (iii) Student know about glass and various types of corrosion and preventive method. (iv) Student know about various pollutants and pollution evolution methods.

Units	Lectures	Topics
I	15	<b>Material science:</b> Mechanical Properties of material and change with respect to temperature. Material of constructions used in Industry: <b>Metals and Alloys:</b> Important metals alloys, iron, copper, aluminum, lead, nickel, titanium and their alloys- mechanical and chemical properties and their applications. <b>Cement:</b> Types of cement, composition, manufacturing process, setting of cement. <b>Ceramic:</b> Introduction, Types, Manufacturing process, Applications, Refractories.
II	15	<b>Polymeric materials:</b> Nomenclature of polymers, classification of polymer, conducting polymer, bio degradable polymer Industrial polymer and composite materials. their constitution, chemical and physical properties, industrial applications.

III	15	<p><b>Glass:</b> Types, composition, manufacture, physical and chemical properties, Applications.  <b>Corrosion:</b> Various types of corrosion relevant to chemical industry-mechanism and preventive method.</p>
IV	15	<p><b>Pollution:</b>  Air, oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, Soil. Pollutants and their statutory limits, pollution evaluation methods.  <b>Air pollution:</b>  Various pollutants, water pollution - organic/inorganic pollutants, BOD, COD, noise pollution, sewage analysis, pesticide pollution, radiation pollution, greenhouse effect, future.</p>

<b>List of Books</b>	<ol style="list-style-type: none"> <li>1. Pollution control in chemical &amp; allied industries, S.P. Mahajan.</li> <li>2. Pollution Control in Industries, A Series of Books by Jones H.P.</li> <li>3. Air Pollutions -Vol. 1 to 4, Editor Stern, A.C. Academic Press.</li> <li>4. Environmental Engineering, G.N. Pandey, Tata Mc Graw, Hill.</li> <li>5. Hand Book of Air Pollution, A. Parker, Tata Mc Graw, Hill.</li> <li>6. Science of Ceramic chemical processing, Hench L.L.</li> <li>7. Science of Ceramics, Stewarts G.H.</li> <li>8. Chemistry of Cement</li> <li>9. Properties of Glass, Morcy G.W.</li> <li>10. Chemistry of Glasses, Paul A.</li> <li>11. Corrosion-causes and prevention, Spellur F.N.</li> </ol>
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3/2/2019

PH

Arshane

25/5/24

PH

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)  
FYUGP (CBCS/LOCF Course)  
Department-CHEMISTRY

M.M. 50 = (ESE 40 + IA 10)

Minimum Passing Marks: 20

PRACTICAL: MATERIAL SCIENCE AND ENVIRONMENTAL  
STUDIES - LAB (DSC LAB)

Section A: Physical Chemistry

Analysis of ores and minerals

1. Lime stone and dolomite: Silica, Sesquioxide ( $R_3O_3$ ) Ca, Mg, L.O.I. etc.
2. Haematite: Iron, Al, Ca, Mg. Acid insoluble & silica etc.
3. Bauxite: Silica, Fe, Al, Be & Ti etc.
4. Cement: Silica, Fe, Al, Ca, Mg &  $SO_4^{2-}$

Gravimetric Estimation

Determination of composition of Ni - DMG complex by gravimetric method.  
Estimation of iron in given salt solution.

Reference Books:

- Vogels Qualitative Inorganic Analysis, A.I. Vogel, Prentice Hall, 7th Edition.
- Vogels Quantitative Chemical Analysis, A.I. Vogel, Prentice Hall, 6th Edition.
- Mendham, J., A. I. Vogel's Quantitative Chemical Analysis Sixth Edition, Pearson, 2009.
- Svehala G. and Sivasankar I. B, Vogel's Qualitative Inorganic Analysis, Pearson, India, 2012.
- T. W. Graham Solomon: Organic Chemistry, John Wiley and Sons.
- Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
- E. L. Eliel: Stereochemistry of Carbon Compounds, Tata McGraw Hill. I. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S.
- R. T. Morrison & R. N. Boyd: Organic Chemistry, Prentice Hall.
- Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand.

3/2/2022 RPL Adhikari

2/2/2022 D/K

		Departmental members	
Chairperson /H.O D .....	<u>25/5/24</u>		
Subject Expert (University Nominee) .....	<u>Abdur</u>	1.....	8.....
Subject Expert .....	<u>M. S. M.</u>	2..... <u>ESL</u>	9.....
Representative (Industry) .....		3.....	10.....
Representative .....		4..... <u>ES</u>	11.....
Representative (Alumni) .....	<u>Wibha</u>	5.....	12.....
Representative (Professor Science Faculty Other Dept.) .....		6..... <u>Yadav</u>	13.....
		7.....	14.....

Abdur ↑ ESL

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**FYUGP (CBCS/LOCF Course)**  
**Department-CHEMISTRY**  
**B. SC. (Multiple Major) - DIPLOMA COURSE (session 2024-25)**  
**Major1-INDUSTRIAL CHEMISTRY**

Session:2024-25	Program: B.Sc.
Semester: IV	Subject: <b>INDUSTRIAL CHEMISTRY</b>
Course Type: DSC	Course Code:
Course Title:	<b>Unit Processes In Organic Chemicals Manufacturing</b>
Credit:4	Lecture: 60
M.M. 100 = (ESE40 + IA10)	Minimum Passing Marks: 40%

<b>Title</b>	<b>ORGANIC CHEMICALS MANUFACTURING</b>
<b>Course Learning Outcome:</b>	<ul style="list-style-type: none"> <li>(i) Student will learn about mechanism of nitration process.</li> <li>(ii) Student will learn about kinetics and mechanism of halogenation</li> <li>(iii) Student know about mechanism of sulphonation and commercial manufacture of several organic compound</li> <li>(iv) Student will learn about oxidation reaction, mechanism and commercial manufacture of several organic compound.</li> </ul>

Units	Lectures	Topics
I	15	Unit processes in organic chemicals manufacture- Nitration: Introduction, Nitrating agents, kinetics and mechanism of nitration processes such as nitration of: <ul style="list-style-type: none"> <li>i Paraffinic hydrocarbons</li> <li>ii Benzene to nitrobenzene and m-dinitrobenzene</li> <li>iii. Chlorobenzene to o- and p- nitrochloro benzenes</li> <li>iv. Acetanilide to p-nitro acetanilide.</li> <li>v. Toluene</li> </ul> Continuous vs. batch nitration.
II	15	Halogenation: Introduction – kinetics of halogenation reactions, reagents for halogenations, Halogenation of aromatic-side and nuclear halogenations, commercial manufacture of chlorobenzenes, chloral, monochloroacetic acid and chloromethane, dichlorodifluoro methane.
III	15	Sulphonation:Introduction, sulphonating agents, chemical and physical factors in sulphonation. Kinetics and mechanism of sulphonation reaction, Commercial sulphonation of benzene, naphthalene alkyl benzene batch vs continuous sulphonation.

IV	15	<b>Oxidation:</b> Introduction, Types of oxidation reactions, oxidizing agents, kinetics and mechanism of oxidation of organic compounds liquid phase oxidation, vapour phase oxidation, commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid
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<b>List of Books</b>	<ol style="list-style-type: none"> <li>1. Unit process in Organic synthesis P.M. Groggins, McGraw Hill.</li> <li>2. Effluent Treatment in process Industries - Inst. of Chem. Engg.</li> <li>3. Effluent Treatment and waste Disposal -Inst. of Chem. Engg.</li> <li>4. Effluent Treatments and Disposal -Inst. of Chem. Engg.</li> </ol>
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gachm

RPL

Armani

25/5/24

DIC

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)  
FYUGP (CBCS/LOCF Course)  
Department-CHEMISTRY

PRACTICAL: Unit Processes in Organic Chemicals Manufacturing - LAB (DSC-LAB)

M.M. 50 = (ESE 40 + IA 10)

Minimum Passing Marks: 20

**Synthesis of Organic Compounds:**

- Acetylation of Salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.
- Aliphatic electrophilic substitution. Preparation of iodoform from ethanol and acetone
- Aromatic electrophilic substitution

**Nitration:**

- Preparation of m-dinitrobenzene.
- Preparation of p-nitroacetanilide

**Halogenation:**

- Preparation of p-bromoacetanilide
- Preparation of 2,4,6-tribromophenol

**List of Books**

- A.I. Vogel: Textbook of Practical Organic Chemistry, Prentice Hall, 5th Edn.
- F. G. Mann & B. C. Saunders: Practical Organic Chemistry, Orient Longman, 1960.
- B.D. Khosla: Senior Practical Physical Chemistry, R. Chand & Co.
- Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.

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3/20/24  
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DL



		Departmental members	
Chairperson /H.O D .....	<u>29/5/24</u>	1.....	8.....
Subject Expert ..... (University Nominee)	<u>AD Khan</u>	2..... <u>PL</u>	9.....
Subject Expert ..... <u>B...</u>	<u>AKJha</u>	3.....	10.....
Representative ..... (Industry)		4..... <u>CV</u>	11.....
Representative ..... (Alumni)	<u>Wibha</u>	5.....	12.....
Representative ..... (Professor Science Faculty Other Dept.)		6..... <u>Yadav</u>	13.....
		7.....	14.....

[Signature]  
D/C

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