SYLLABUS FOR
THE FOUR-YEAR UNDERGRADUATE PROGRAMME
(FYUGP)
SESSION 2025-26

INDUSTRIAL CHEMISTRY

**SEMESTER ~~V~~ VI III, 10th Dec

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE,

RAJNANDGAON (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction				
Program: Bachelor in Science *(Diploma / Degree/Honors)*		**Semester-III**		Session:**2024-2025**
1	**Course Code**	**ICSC-03T**		
2	**Course Title**	**POLYMERIC MATERIALS AND UNIT PROCESSES IN ORGANIC CHEMICALS MANUFACTURE**		
3	**Course Type**	**DSC**		
4	**Pre-requisite(if, any)**	***As per Government norms***		
5	**Course Learning Outcomes(CLO)**	➢ ***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 polymeric material, glasses and composites, their properties, formation, crystallization, and structure with wide industrial applications.*** ➢ ***To understand 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.***		
6	**Credit Value**	**03Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max.Marks:100**		**MinPassingMarks:40**

PART-B: Content of the Course

Total No. of Teaching–learning Periods (01Hr.perperiod)

Module /Unit	Topics (Course contents)	No. of Period
I	**Material Science:** Mechanical properties of material and change with respect to temperature. **Cement:** Types of cement, composition, manufacturing process, setting of cement. **Ceramic:** Introduction, Types, Manufacturing process, Applications, Refractories.	11
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.	11
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,	12

	Toluene. **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.	
IV	**Sulphonation:** Introduction, sulphonating agents, chemical and physical factors in sulphonation. Mechanism of sulphonation reaction, Commercial sulphonation of benzene, naphthalene, alkyl benzene. **Oxidation:** Introduction, Types of oxidation reactions, oxidizing agents, mechanism of oxidation of organic compounds liquid phase oxidation, vapor phase oxidation, commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.	**11**
Keywords	***Material science, cement and ceramics, polymeric materials, glass and corrosion, Nitration, halogenation, sulphation, oxidation.***	

Signature of Convener & Members:

PART–C

Learning Resources: TextBooks, Reference Books and Others

Textbooks Recommended–

1. *Mahajan, S. P. (2009). Air Pollution Control. The Energy And Resources Institute (TERI).*
2. *Bhaskara, S., Fakrudeen, S. P., Raju, V. B., Murthy, H. A., & Raghu, A. V. (2021). Comparative Studies Of Inhibitive Effects Of Diamines On Corrosion Of Aluminium Alloy In Presence Of Acic Media. Rasayan J. Chem, 72-78.*

Reference books Recommended–

1. *Holdridge, D. A. (1963). GH Stewart Science of Ceramics. Vol. I London and New York (Academic Press For The British Ceramic Society), 1962. 334 Pp., Price£ 3. 5s. Mineralogica Magazine and Journal Of The Mineralogical Society, 33(261), 530-531.*
2. *Paul, A. (1989). Chemistry of Glasses. Springer Science & Business Media.*
3. *March, J. (1977). Advanced Organic Chemistry: Reactions, Mechanisms, And Structure (P. 825) New York: Mcgraw-Hill.*

OnlineResources– e-Resources/e-booksande-learningportals

- https://www.unsw.edu.au/science/our-schools/materials/engage-with-us/high-school-students-and-teachers/online-tutorials/ceramics#:~:text=Concrete%20is%20not%20officially%20a,the%20sand%20and%20aggregate%20particles.
- https://www.corrosionpedia.com/the-corrosion-of-polymeric-materials/2/1548#:~:text=Polymeric%20materials%20are%20not%20corrosion,of%20corrosion%20in%20these%20materials.&text=Polymeric%20materials%20have%20wide%20applications,to%20corrosion%20in%20these%20materials.
- https://dergipark.org.tr/en/download/article-file/1629713
- https://byjus.com/chemistry/benzene-reactions/

Part-D:AssessmentandEvaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100Marks
Continuous Comprehensive Evaluation(CCE): 30 Marks
Semester End Exam(SEE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks.
Semester End Exam(SEE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks.**	

Name and Signature of Convener and Members of CBoS

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF INDUSTRIAL CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction				
Program: Bachelor in Science *(Diploma / Degree/Honors)*		**Semester-III**		Session:**2024-2025**
1	**Course Code**	**ICSC-03P**		
2	**Course Title**	**INDUSTRIAL CHEMISTRY LAB. COURSE-III**		
3	**Course Type**	**DSC**		
4	**Pre-requisite(if, any)**	As per program ~~Asper Government norms~~		
5	**Course Learning Outcomes(CLO)**	➢ *Understanding reactions with their mechanisms (e.g., nitration, sulphonation, Friedel-craft's reaction, etc.).* ➢ *Determination of flow control, flash point and ignition point.* ➢ *Understanding principles and working mechanisms of flow measuring devices.* ➢ *Conducting limit tests for heavy metals like, Pb, As, Fe, and ash content.*		
6	**Credit Value**	**01Credit**	*Credit =30 Hours Laboratory or Field learning/Training*	
7	**Total Marks**	**Max.Marks:50**		**MinPassingMarks:20**

PART-B: Content of the Course

Total No. of Teaching–learning Periods (30Hr. per period)

Module	Topics(Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course.	**UNIT PROCESS:** One to two examples of each of the following: - Nitration, Sulphonation, Friedel-crafts reaction, Esterification, Hydrolysis, Oxidation, Halogenation, Chloro-Sulphonation, Reduction, Polymerization, Reaction of diazonium salts. **PROCESS INSTRUMENTATION:** Transducers of different types, use of Transducers for measuring flow control. Determination of flash point and ignition points of liquids. **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). **Limit Tests:** Limit tests for heavy metals Pb, As, Hg, Fe, and ash content.	**30 (30Hrs.)**
Keywords	***Unit process, Friedel-crafts reaction, Diazonium salts, process instrumentations, transducers, flow measuring devices, limit tests.***	

Signature of Convener & Members:

PART–C

Learning Resources: Text Books, Reference Books and Others

Textbooks Recommended–

1. *Ahluwalia, V. K., & Aggarwal, R. (2001). Comprehensive practical organic chemistry: Preparation and quantitative analysis (1st ed.). Universities Press.*
2. *Ahluwalia, V. K., & Dhingra, S. (2004). Comprehensive practical organic chemistry: Qualitative analysis (1st ed.). Universities Press.*
3. *Behera, C. C. (2020.). Practical Lab Manual of Pharmaceutical Organic Chemistry – I, IP Innovative Publication*

Reference books Recommended–

1. *Furniss, B. S., Hannaford, A. J., Smith, P. W. G., Tatchell, A. R., & Vogel, A. I. (1996). Vogel's textbook of practical organic chemistry (5th ed.). Longman.*
2. *Mann, F. G., & Saunders, B. C. (Year). Practical Organic Chemistry. Pearson Publication*

OnlineResources–
e-Resources/e-booksande-learningportals

- https://byjus.com/chemistry/friedel-crafts-acylation-alkylation/
- http://www.saranathan.ac.in/attachments/eresources/ece/R2017/OIC751.pdf
- https://www.bspublications.net/downloads/059cc8f84560f2_Ch-1_Subba%20Rao_Practical%20Pharmaceutical%20In-organic%20Chemistry.pdf
- https://www.usp.org/sites/default/files/usp/document/harmonization/excipients/pf31-2-saccharin.pdf

Part-D:AssessmentandEvaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
Continuous Internal Assessment (CIA): 15 Marks
End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test /Quiz-(2):10&10 Assignment/Seminar+Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
Semester End Exam(SEE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. Status**

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