

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

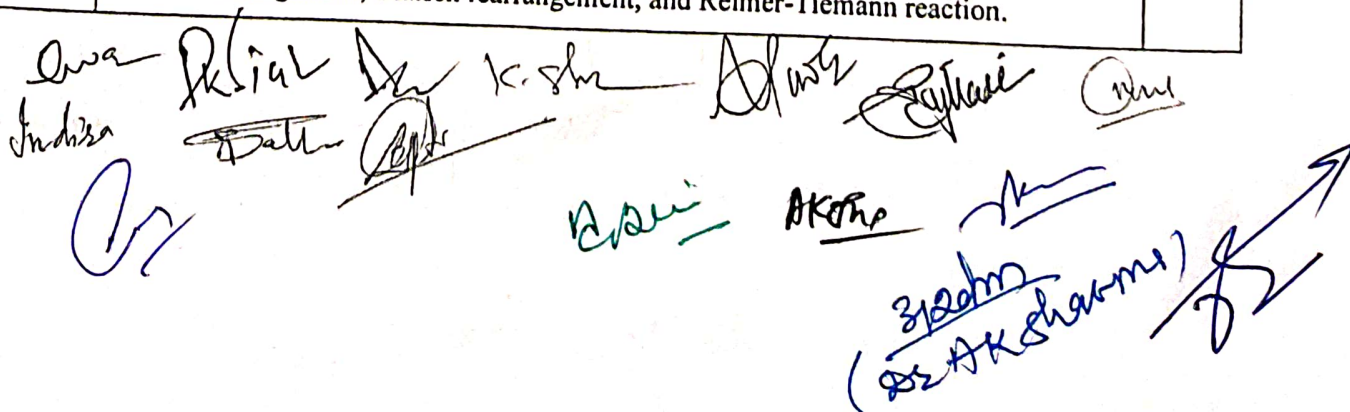
PART-A: Introduction

Program: Bachelor in Science (Diploma/Degree/Honors)		Semester - IV	Session: 2024-2025
1	Course Code	CHSC-04T	
2	Course Title	ORGANIC AND PHYSICAL CHEMISTRY-I	
3	Course Type	DSC	
4	Pre-requisite(if,any)	-	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Master the synthesis, properties, and reactivity of various functional groups and apply this knowledge to understand their significance in organic chemistry. ➤ Employ the principles of chemical/ionic equilibria, their influencing factors and applications ➤ Interpret phase diagrams for one and two-component systems, determine degrees of freedom, and identify the triple point. ➤ Master the principles and applications of liquid-liquid mixtures using Raoult's law, Henry's law, and Nernst distribution law. 	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max.Marks: 100	Min Passing Marks:40

PART -B: Content of the Course

Total No.of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics(Course contents)	No.of Period
I	<p>A. Halides (5 hrs)</p> <p>(i) Alkyl Halides: Preparation: from alkenes and alcohols. Reactions: Nucleophilic substitution reactions of alkyl halides (alcohol, ester, nitrile & isonitrile formation, Williamson's ether synthesis), mechanism and stereochemistry of nucleophilic substitution reactions (SN1 and SN2), factors affecting SN1 and SN2 reactions.</p> <p>(ii) Aryl Halides: Chlorobenzene: Preparation by aromatic halogenation and Sandmeyer reaction. Aromatic nucleophilic substitution involving Benzyne Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$). Reactivity and Relative strength of C-Halogen bond in alkyl and aryl/Vinyl halides.</p> <p>B. Alcohols & Phenols (7hrs)</p> <p>(i)Alcohols</p> <p>(a)Monohydric-nomenclature, methods of formation, Properties & chemical reactions distinction between primary, secondary & tertiary alcohols.</p> <p>(b)Dihydric alcohols: Nomenclature, methods of formation of ethylene glycol (from ethylene, epoxide, ethylene dibromide and ethylene diamine). Chemical reactions of vicinal glycols: with carbonyl compounds, dehydration, oxidative cleavage with $\text{Pb}(\text{OAc})_4$ and HIO_4 and Pinacol-Pinacolone rearrangement (with mechanism).</p> <p>(c) Trihydric alcohols: Nomenclature and methods of formation (from hydrolysis of fats and oils, propene and acrolein), chemical reactions of glycerol (with PCl_5, HI, oxidation, and dehydration) and uses/applications.</p> <p>(ii)Phenols</p> <p>Nomenclature and methods of formation, physical properties, and acidic character. Resonance stabilization of phenoxide ion. Comparative acidic strength of alcohols and phenols. Electrophilic aromatic substitution, acetylation, and carboxylation. Mechanism of Fries rearrangement, Claisen rearrangement, and Reimer-Tiemann reaction.</p>	12



PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Bahl, A. (2010). *Advanced organic chemistry*. S. Chand publishing.
2. Singh, J & Yadav, L. D. S. (2016) *Advanced organic chemistry*. Pragati Prakashan Meerut.
3. Puri, L. B., Sharma, L. R., & Pathania, M. S. (2013). *Principles of physical chemistry*. Vishal Publishing Co.
4. Kapoor, K. L. (2019). *A Textbook of Physical Chemistry, Thermodynamics and Chemical Equilibrium (SI Units) - Vol. 2, 6th Edition*.

Reference Books recommended-

1. Boyd, R. N., & Morrison, R. T. (1983). *Organic Chemistry: (uden title)*. Allyn and Bacon.
2. *Physical Chemistry*
3. Atkins, P. W., De Paula, J., & Keeler, J. (2023). *Atkins' physical chemistry*. Oxford university press.
4. McQuarrie, D. A., & Simon, J. D. (2004). *Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi*.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://ncert.nic.in/ncerts/l/lech202.pdf>
- <https://unacademy.com/content/wp-content/uploads/sites/2/2022/10/30.-Aldehydes-Ketones-and-Carboxylic-Acid.pdf>
- <https://egyankosh.ac.in/bitstream/123456789/68232/3/Unit-3.pdf>
- [https://magadhmahilacollege.org/wp-content/uploads/2020/04/photochemistry and jablonski diagram M.sc II Sem.pdf](https://magadhmahilacollege.org/wp-content/uploads/2020/04/photochemistry%20and%20jablonski%20diagram%20M.sc%20II%20Sem.pdf)

Online Resources–

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

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

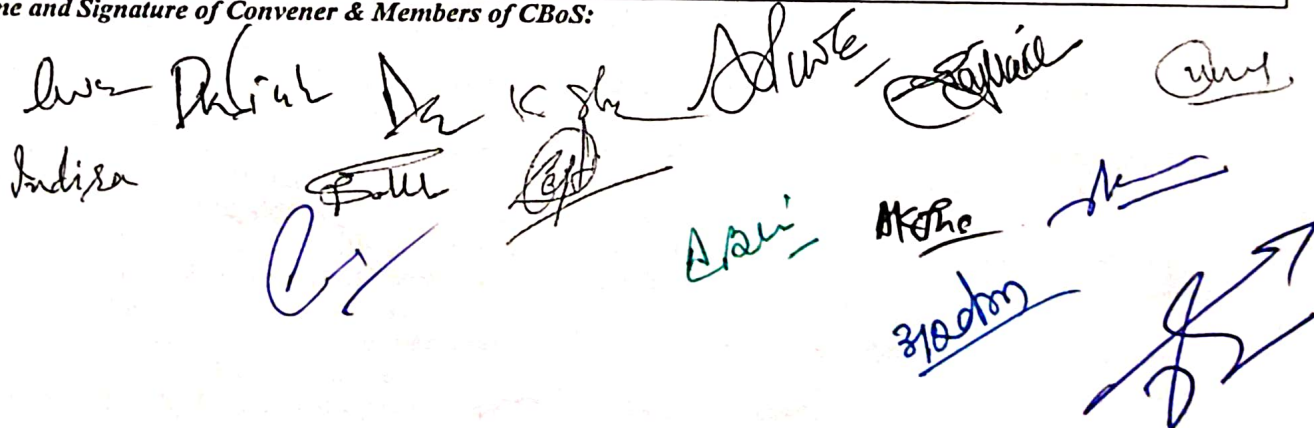
Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA):30 Marks

End Semester Exam(ESE): 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
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:



FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM

PART-A: Introduction

Program: Bachelor in Science (Diploma / Degree/Honors)		Semester - IV	Session: 2024-2025
1	Course Code	CHISC-04P	
2	Course Title	CHEMISTRY LAB. COURSE-IV	
3	Course Type	DSC	
4	Pre-requisite(if, any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Understand the fundamentals of organic compounds analysis including preparation of sodium extract and detection of elements. ➤ Identify functional groups and prepare derivatives. ➤ Determine the pH of various samples like water/acid/base/soil etc. ➤ Apply the concepts of phase equilibria to determine critical solution temperature and study concepts of Nernst distribution law and determine equilibrium constant of various reactions. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max.Marks:50	Min Passing Marks:20

PART -B: Content of the Course

Total No. of learning-Training/performancePeriods:30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Periods
Lab./Field Training/ Experiment Contents of Course	<p>Organic Analysis Systematic Identification of organic compounds: a. Test for aliphatic and aromatic nature of substances. b. Test for saturation and unsaturation. c. Detection of elements (N, S, and halogens) in organic compounds. d. Identification of functional groups: i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones, v) Esters vi) Carbohydrates vii) Amines viii) Amides, ix) Halogen compounds e. Determination of melting and boiling points. f. Preparation of solid derivatives. pH determination Determination of pH of soil, water. To measure the pH of various solutions using pH indicators and pH meter. To determine the value of K_a for an unknown acid. To prepare and study the properties of buffer solutions. Phase Equilibrium: 1) To determine the critical solution temperature of two partially miscible liquids (phenol-water systems). 2) To study the effect of solute such as (i) sodium chloride (NaCl), (ii) succinic acid ($\text{HOOC-CH}_2\text{-CH}_2\text{-COOH}$) on the critical solution temperature of two partially miscible liquids (e.g. phenol – water system). 3) To construct the phase diagram of two components (e. g. diphenylamine-benzophenone system) by cooling curve method. Nernst Distribution Law 1) To determine the partition coefficient of Iodine between water and carbon tetrachloride/Kerosene. 2) To determine the partition coefficient of benzoic acid between water and benzene.</p>	30

	3) To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by distribution method.	
Keywords	Organic analysis, Aromatic/Aliphatic compounds, Saturated/unsaturated compounds, Element detection, Functional groups, Derivatives for functional groups, pH, Phase equilibria, Nernst distribution law.	

Signature of Convener & Members (CBoS) :

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Sahu, D. P. & Bapat, K. N. (2022) *Unified Practical Chemistry*, Navbodh Prakashan.
2. Yadav, J. B. (2006). *Advanced Practical Physical Chemistry*. Krishna Prakashan Media.
3. Pandey, O. P., Bajpai, D. N., Giri, S. (2010). *Practical Chemistry*. S. Chand Publisher.

Reference Books Recommended:

1. Moudgil, H. K. (2010). *Textbook of Physical Chemistry*. PHI Learning Pvt. Ltd.
2. Adamson, A. (2012). *A Textbook Of Physical Chemistry*. Elsevier.
3. Findlay, A. (1923). *Practical Physical Chemistry*. Longmans, Green.
4. Leonard, J, Lygo, B & Procter, G. (2013). *Advanced Organic Practical Chemistry*, CRC Press.

Online Resources–

- e-Resources / e-books and e-learning portals
- https://faculty.ksu.edu.sa/sites/default/files/vogel_-_practical_organic_chemistry_5th_edition.pdf
- <https://tech.chemistrydocs.com/Books/Physical/Advanced-Physical-Chemistry-Experiments-by-J-N-Gurtu-&-Amit-Gurtu.pdf>
- <https://byjus.com/chemistry/conductometric-titration/>
- [https://chem.libretexts.org/Courses/University_of_California_Davis/Chem_4B_Lab%3A_General_Chemistry_for_Majors_II/1%3A_Thermochemistry_\(Experiment\)](https://chem.libretexts.org/Courses/University_of_California_Davis/Chem_4B_Lab%3A_General_Chemistry_for_Majors_II/1%3A_Thermochemistry_(Experiment))
- https://www.ulm.edu/chemistry/courses/manuals/chem1010/experiment_10.pdf
- <https://www.masterjeeclases.com/wp-content/uploads/2019/02/11.Practical-Organic-ChemistryTheory.pdf>

Online Resources–

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

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA): 15 Marks

End Semester Exam(ESE): 35 Marks

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

Name and Signature of Convener & Members of CBoS:

COURSE CURRICULUM

Module /Unit	Topics(Course contents)	No.of Period
I	Introduction to Environmental Chemistry Biosphere, Lithosphere, Hydrosphere and Atmosphere, Ecological principles- aspects of ecology, classification, types of ecosystems. Biogeochemical cycles- carbon, nitrogen, phosphorous, oxygen, hydrogen. Thermal pollution: sources, harmful effects, and prevention of thermal pollution. Noise pollution: sources, effects, and control of noise pollution.	12
II	Water Origin, physico-chemical properties of water, sources of water, hydrological cycle, criteria of water quality, Water management- water shed management, rainwater harvesting, water pollution- sources, consequences and harmful effects of water pollution, strategies for water pollution control.	11
III	Air Major regions of the atmosphere, composition of the atmosphere, temperature inversion and air pollution episodes, photochemistry of the atmosphere, depletion of the stratospheric ozone, greenhouse effect, greenhouse gases, remedial measures for reversion of greenhouse effect, acid rain, photochemical smog, particulate matter.	11
IV	Soil and radiation pollution Chemical and mineralogical composition of soil, classification of soil, types of soil- saline and alkaline, physical properties – texture, bulk density, permeability, chemical properties—Ion exchange capacity, soil pH and micro and macro nutrient availability. Introduction to radiation chemistry, sources of radioactive pollution, effects of radioactive pollution, protection from radiation, control of radiation.	11
Keywords	<i>Environment, Chemistry, Atmosphere, Hydrosphere/Biosphere/lithosphere, Biogeochemical cycles, water, water management, Air, Acid rain, Photochemical smog, Greenhouse gases,</i>	

[Handwritten notes:]

Cycles, water, water management, Air, Acid rain, Photochemical smog, Greenhouse gases,
Dr. K.S.H. Datta
Inclara, Milish, K.S.H., Datta, Sylabi
Vine, Rohit, P.D.
Alexis, Akone, Zachm →
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Learning Resources: Text books, Reference Books and Others

1. Dara, S. S. (2002). *Environmental chemistry*. New Delhi: S Chand & Company Ltd.
2. De, A. K. (2003). *Environmental chemistry*. New Delhi: New Age International.
3. Mahajan, (2010). *Environmental chemistry*. New Delhi: S Chand & Company Ltd.
4. Kudesia, V. P. (1985). *Water pollution*. Pragati Prakashan.

Books Recommended–

1. Chiras, D. D. (1994). *Environmental science* (4th ed.). Jones & Bartlett Learning.
2. Bockris, J. O. M. (1977). *Environmental chemistry*. Academic Press.
3. Lodge, J. P. (1994). *Methods of air sampling and analysis*. Publications, Jaipur.
4. Moore, W., & Moore, J. (2010). *Environmental chemistry*. CRC Press.

- <https://ncert.nic.in/textbook/pdf/kech207.pdf>
- <https://archive.nptel.ac.in/courses/122/106/122106030/>
- <https://scienceinfo.com/environmental-chemistry-definition-importance-application-and-careers/>
- <https://www.ncbi.nlm.nih.gov/books/NBK83730/>
- <https://ebooks.inflibnet.ac.in/esp16/chapter/water-pollution/#:~:text=The%20amount%20of%20dissolved%20oxygen,dissolved%20oxygen%20than%20saline%20water.>
- [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry - The Central Science \(Brown et al.\)/18%3A_Chemistry of the Environment](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.nrdc.org/stories/water-pollution-everything-you-need-know#whatis>

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA): 30 Marks

EndSemester Exam(ESE): **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
End Semester Exam(ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4=20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks.	

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

COURSE CURRICULUM				
PART- A: Introduction				
Program: Bachelor in Science (Diploma / Degree/Honors)			Semester - IV	Session: 2024-2025
1	Course Code	CHSE-02P		
2	Course Title	ENVIRONMENTAL CHEMISTRY LAB. COURSE		
3	Course Type	DSE		
4	Pre-requisite (if, any)	-		
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none">➤ To know the basic idea on techniques of water analysis and acidity alkalinity➤ To get experience with the calculations of BOD and COD➤ To understand the basics of soil analysis viz. pH, Conductivity.➤ To have an experience on the determination of heavy metals in soil and Colorimetric estimation of iron and manganese.➤ To familiarize with interpretation of data		
6	Credit Value	01Credit	Credit =30 Hours Laboratory or Field learning/Training	
7	Total Marks	Max.Marks:50		Min. Passing Marks:20
PART-B: Content of the Course				
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)				
Module	Topics(Course contents)			No. of Period
Lab/Field Training/Experiment Contents of Course.	Water Analysis <ul style="list-style-type: none">a. Alkalinityb. Acidityc. Temporary, Permanent and total hardnessd. Sulphatee. Phosphorus			30
	Water analysis <ul style="list-style-type: none">e. Nitritesf. Chloridesg. D.O, BOD and CODh. Insecticidesi. Pesticides			
	Analysis of chemicals used in water and waste water treatment-Alum, bleaching powder, activated carbon.			
	Determination and comparison of chlorine content in tap water, storage tank and swimming pool.			
	Soil Analysis Determination of: <ul style="list-style-type: none">a. pHb. Conductivityc. Cad. Mge. Heavy metals like Cr, Pb, Cd, Zn.			
Miscellaneous Analysis of nutrients – Nitrogen (total, ammonia,nitrite, and nitrate), Phosphate Determination of N,P,K of soil				

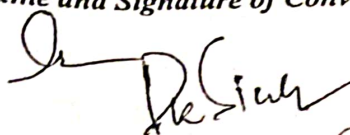
	<p>Determination of macro and micro nutrients in soil.</p> <p>Sampling of water- tap water, well water, overhead storage tank water pond water and lake water.</p> <p>Physicochemical and organoleptic characteristics of the above water samples.</p> <p>Statistical evaluation of the data obtained for optimization of results.</p> <p>Determination of Total solids, Total dissolved solids and total suspended solids and its significance.</p> <p>Determination of noise pollution in a particular area with noise dosimeter.</p> <p>Study of particulate matter.</p> <p>Study of atmospheric chemistry.</p> <p>Air Monitoring</p> <p>Gas detection.</p>
Keywords	Sampling, Water, soil, N/P/K, pH, Conductivity, acidity & alkalinity, Heavy metals.

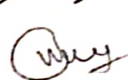
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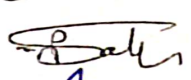
PART-C
Learning Resources: Text Books, Reference Books and Others
<p>Textbooks Recommended-</p> <ol style="list-style-type: none"> 1. Dara, S. S., & Asole, B. G. (2017). <i>Environmental chemistry: Practical approach (2nd ed.)</i>. New Age International (India) Publishers. 2. Trivedi, R. K., Goyal, P., & Trisal, B. S. (2018). <i>Manual of water and wastewater analysis (2nd ed.)</i>. ABD Publishers & Distributors. 3. Sehgal, H. S. (2010). <i>A textbook of soil chemical analysis (2nd ed.)</i>. Kalyani <p>Reference Books Recommended-</p> <ol style="list-style-type: none"> 1. Vogel, A. I. (1955). <i>A text-book of quantitative inorganic analysis: theory and practice</i>. Longmans, Green and Company. 2. Sandell, E. B. (1945). <i>Colorimetric determination of traces of metals (Vol. 59, No. 6, p. 481)</i>. LWW. 3. Boubel, R. W., Vallero, D., Fox, D. L., Turner, B., & Stern, A. C. (2013). <i>Fundamentals of air pollution</i>. Elsevier. 4. Clesceri, L. S. (1998). <i>Standard methods for examination of water and wastewater</i>. American public health association, 9. 5. Rump, H. H. (1999). <i>Laboratory manual for the examination of water, waste water and soil (No. Ed. 3)</i>. Wiley-VCH Verlag GmbH. <p>Online Resources- e-Resources/e-books and e-learning portals</p> <ul style="list-style-type: none"> • https://ncert.nic.in/textbook/pdf/kech207.pdf • https://archive.nptel.ac.in/courses/122/106/122106030/ • https://scienceinfo.com/environmental-chemistry-definition-importance-application-and-careers/ • https://www.ncbi.nlm.nih.gov/books/NBK83730/ • https://ebooks.inflibnet.ac.in/esp16/chapter/water-pollution/#:~:text=The%20amount%20of%20dissolved%20oxygen,dissolved%20oxygen%20than%20saline%20water. • 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.nrdc.org/stories/water-pollution-everything-you-need-know#whatis • https://www.envirotech-online.com/news/gas-analyser/157/envea/portable-multi-gas-analyser-gains-qall-certification-for-so2/60799


PART -D: Assessment and Evaluation				
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		Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks	
	Assignment/Seminar +Attendance - 05			
	Total Marks - 15			
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment			Managed by Course teacher as per lab. status
	D. Performed the Task based on lab. work - 20			
	Marks			
	E. Spotting based on tools & technology (written) – 10			
	Marks			
	F. Viva-voce (based on principle/technology) - 05			
	Marks			

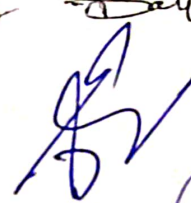
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 Indira



 Anurag

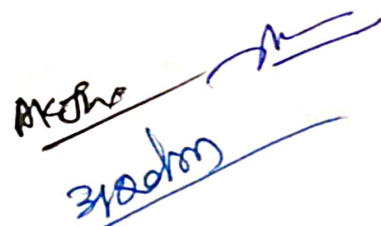

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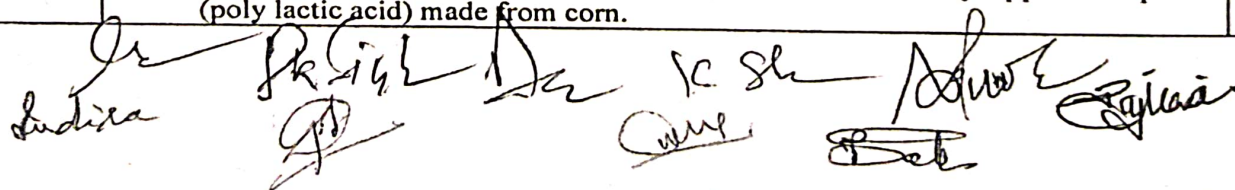

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Certificate / Diploma / Degree)		Semester - II/IV/V/VI	Session: 2024-2025
1	Course Code	CHSEC	
2	Course Title	GREEN CHEMISTRY	
3	Course Type	SEC	
4	Pre-requisite(if, any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Understand needs, goals, and obstacles in green chemistry. ➤ Understand and application of twelve principles of chemistry. ➤ Design green solvents and green reactions. ➤ To interpret and execute case study, survey, and projects on Green Chemistry. 	
6	Credit Value	2 Credits (1C + 1C)	Credit = 15 Hours –Theoretical learning and = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No.of Teaching–learning Periods: Theory–15 Periods (15 Hrs.) and Lab. or Field learning/Training 30Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Theory Contents	<p>Introduction to Green Chemistry: What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry.</p> <p>Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following:</p> <ul style="list-style-type: none"> • Designing a Green Synthesis using these principles; Prevention of Waste/ by products; maximum incorporation of the materials used in the process into the final products, Atom Economy, addition, substitution, and elimination reactions. • Prevention/ minimization of hazardous/ toxic products reducing toxicity, and risks (hazard × exposure); waste or pollution prevention hierarchy. • Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorosol biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents. <p>Future Trends in Green Chemistry: Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; Green chemistry in sustainable development.</p>		15
Lab./Field Training Contents	<ul style="list-style-type: none"> • Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis). • Microwave assisted reactions in water: Hofmann elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction. • Right fit pigment: synthetic azo pigments to replace toxic organic and inorganic pigments. • An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn. 		30



	Case study/Project Case study/Project on Green chemistry, Role of green chemistry in lab safety, and implications of green chemistry.	
Keywords	Green chemistry, Green synthesis, Green solvents, Green reactions, principles of Green chemistry, Hofmann elimination, Diels-Alder reaction, oxidation, and reduction.	

Signature of Convener & Members (CBoS):

PART-C: Learning Resources

Text Books, Reference Books and Others

Textbooks Recommended-

1. Ahluwalia, V.K. (2013). *Green chemistry: A textbook*. Alpha Science International.
2. Shukla, S., Gulati, S., & Batra, S.K. (2020). *A textbook of green chemistry: benign by design*. Shree kala Prakashan.
3. Kumar, V. (2013). *An introduction to green chemistry*. Vishal publishing Co.
4. Lancaster, M. (2020). *Green chemistry: an introductory text*. Royal society of chemistry.

Reference books Recommended:

1. Perosa, A., & Zecchini, F. (2007). *Methods and reagents for green chemistry: an introduction*. John Wiley & Sons.
2. Clark, J. H., & Macquarrie, D. J. (Eds.). (2008). *Handbook of green chemistry and technology*. John Wiley & Sons.
3. Ameta, S. C., & Ameta, R. (Eds.). (2023). *Green Chemistry: Fundamentals and Applications*. CRC press.
4. Anastas, P. T. (Ed.). (2013). *Handbook of green chemistry (Vol. 1)*. Wiley-VCH.

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

- [https://www.mygreenlab.org/uploads/2/1/9/4/21945752/gc - green chem guide-beyond benign my green lab.pdf](https://www.mygreenlab.org/uploads/2/1/9/4/21945752/gc_-_green_chem_guide-beyond_benign_my_green_lab.pdf)
- <https://www.organic-chemistry.org/topics/green-chemistry.shtml>
- <https://royalsocietypublishing.org/doi/10.1098/rsos.191378>
- <https://www.gvsu.edu/labsafety/green-chemistry-99.htm>

PART-D: Assessment and Evaluation

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 Coordinator)	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
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Coordinator as per skilling

Name and Signature of Convener & Members of CBoS:

Indira K. Singh, A. K. Singh, K. S. Singh, M. Singh, S. Singh, S. Singh, S. Singh