four-year

# DEPARTMENT OF INDUSTRIAL CHEMISTRY
## COURSE CURRICULUM

| **PART-A: Introduction** | | | | |
|---|---|---|---|---|
| **Program: Bachelor in Science** *(Diploma / Degree/Honors)* | | | **Semester - IV** | Session: **2024-2025** |
| 1 | **Course Code** | **ICSE-02T** | | |
| 2 | **Course Title** | **ENVIRONMENTAL REMEDIATION** | | |
| 3 | **Course Type** | **DSE** | | |
| 4 | **Pre-requisite(if,any)** | ***As per program*** | | |
| 5 | **Course Learning. Outcomes(CLO)** | ➢ ***Understand pollutants, their statutory limits and air pollution as well as water pollution.***<br>➢ ***Acquire knowledge and handling of pesticide, gaseous, and solod waste pollution.***<br>➢ ***Gain knowledge about soil economics and project handling.***<br>➢ ***Acquire knowledge and handling technology and quality control.*** | | |
| 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 | **Pollutants and their statutory limits:**<br>Definition and classification of pollutants, primary and secondary pollutants, Pollution evaluation methods.<br>**Air Pollution:**<br>Sources and classification of air pollution, major air pollutants and theirhealth impacts, phenomenon of acid rain, photo chemical smog and ozone depletion, composition of fly-ash, pollution control equipment/techniques.<br>**Water pollution:**<br>Types of water pollution, organic and inorganic pollutants, point and nonpoint sources of water pollution, estimation of chlorine in water, measurement of BOD & COD, techniques for removal of waste from water. | 12 |
| II | **Pesticide pollution:**<br>Classification of chemical pesticides, examples of organochlorines and organophosphates, persistent organic pollutants (POPs) and their half-lives, environmental effects of pesticides, soil and water contamination and its impact, bioaccumulation of pesticides and pesticide contamination in food.<br>**Solid & gaseous wastes:**<br>Removal of solid contaminants of wastes- coagulation, sedimentation, flocculation, solid wastedisposal, incineration, fuel pelletization, soil conditioning Adsorption, catalytic/non catalytic conversion, recovery of important gases, $CO_2$, $SO_2$, NO etc. electrostatic precipitation and bag filters. | 11 |
| III | **Soil economics A**: Factors involved in project cost estimation; methods employed for the estimation of capital investment, capital formation, elements of cost accounting, interest and investment costs, time value of money equivalence.<br>**Soil economics B**:Methods of determining depreciation, some aspects of marketing, pricing policy, profitability criteria, economics of selecting alternatives, variation of cost with capacity, break-even point, optimum batch sizes, production scheduling etc. | 11 |
| IV | **Soil economics C:** Need, scope and characteristics of entrepreneurship, special schemes | 11 |

| | | |
|---|---|---|
| | for technical entrepreneurs' development (STED), exposure to demand based, resource based, service based, import substitute and export promotion industries, criteria for principles of products selection and development.<br>**Choice of technology and quality control:**<br>Plant and equipment's, techno-economic feasibility of the projects, plant layout and process planning for the project. Quality control, quality assurance and testing of the product, packaging, advertising and aftersales service. | |
| *Keywords* | ***Pollution, air, water, soil, pesticides, solid, gaseous, wastes, economics, technology quality control.*** | |

***Signature of Convener & Members (CBoS)s:***

## PART–C: Learning Resources

**Text Books, Reference Books and Others**

***Text Books Recommended –***

1. Trivedy, R. K., & Raman, N. S. (2002). *Industrial Pollution and Environmental Management.* Scientific Publishers.
2. Rathore, H. S., & Nollet, L. M. (Eds.). (2012). *Pesticides: Evaluation Of Environmental Pollution.* CRC Press.
3. De, A. K. (2003). Environmental Chemistry. New Delhi: New Age International.

***Reference Books Recommended –***

1. *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.*
2. *Rad, P. F. (2001). Project Estimating and Cost Management. Berrett-Koehler Publishers.*

**Online Resources–**

**e-Resources / e-books and 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 andEvaluation

**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~~<br>Assignment/Seminar- **10**<br>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**<br>Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20Marks**<br>Section B: Descriptive answer type qts.,**1out of 2** from each unit- **4x10=40Marks** | |

***Name and Signature of Convener & Members of CBoS:***

Indira Next page

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

**PART-A: Introduction**

| Program:Bachelor in Science *(Diploma / Degree/Honors)* | | Semester - IV | Session: 2024-2025 |
|---|---|---|---|
| 1 | CourseCode | ICSE-02P | |
| 2 | CourseTitle | ENVIRONMENTAL REMEDIATION LAB COURSE | |
| 3 | CourseType | DSE | |
| 4 | Pre-requisite(if,any) | *As per program* | |
| 5 | Course Learning. Outcomes(CLO) | ➢ *To know the basic idea on techniques of water analysis and acidity alkalinity.*<br>➢ *To get experience with the calculations of BOD and COD*<br>➢ *To Understand the basics of soil analysis viz. pH, Conductivity.*<br>➢ *To have an experience on the determination of heavy metals in soil.* | |
| 6 | CreditValue | 1 Credits | *Credit =30 Hours Laboratory or Field learning/Training* |
| 7 | TotalMarks | Max.Marks:50 | Min Passing Marks:20 |

**PART -B: Content of theCourse**

TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)

| Module | Topics(Coursecontents) | No.ofPeriod |
|---|---|---|
| Lab./Field Training/ Experiment Contents of Course | • Determination of acidity and alkalinity of water samples.<br>• Determination of temporary, permanent, and total hardness of water.<br>• Determination of chloride, sulphate, nitrite, and phosphates in water samples.<br>• Determination of D.O, BOD, and COD.<br>• Determination of pH of soil samples.<br>• Determination of conductivity of soil samples.<br>• Determination of metal (Ca & Mg).<br>• Determination of heavy metals like Cd, Pb, Cr, Zn.<br>• Report on soil economics.<br>• Project/survey on environmental management/technologies, and quality control.. | 30 |
| *Keywords* | *Water, acidity, alkalinity, water hardness, D.O., BOD, COD, metals, pH, economics, technology, water quality.* | |

*SignatureofConvener&Members (CBoS):*

## PART–C:Learning Resources

**Text Books, Reference Books and Others**

***Text Books Recommended –***

1. *Birdie, G. S. (2020).* Water supply and sanitary engineering *(10th ed.). Dhanpat Rai Publishing Company.*
2. *Biswas, T. D., & Mukherjee, T. K. (2008).* A textbook of soil science *(2nd ed.). Tata McGraw-Hill Education.*
3. *Das, D. K. (2011).* Soil analysis in agricultural chemistry and environmental science. *Kalyani Publishers.*

***Reference Books Recommended-***

1. *Vogel, A. I. (1955). A text-book of quantitative inorganic analysis: theory and practice. Longmans, Green and Company.*
2. *Harrison, R. M. (Ed.). (2012). Handbook of air pollution analysis. Springer Science & Business Media.*
3. *Boubel, R. W., Vallero, D., Fox, D. L., Turner, B., & Stern, A. C. (2013). Fundamentals of air pollution. Elsevier.*

**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.

**Online Resources–**

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

## PART-D: Assessment andEvaluation

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

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

***Name and Signature of Convener & Members of CBoS:***

Indira