**Annexure ‘CD – 01’**

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**FORMAT FOR COURSE CURRICULUM**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **L** | **T** | **P/S** | **SW/FW** | **No. of PSDA** | **TOTAL CREDIT UNITS** |
| 3 | - | 2 | 2 | 3 | 5 |

**Course Title: ENGINEERING CHEMISTRY Credit Units:5**

**Course Level: UG Course Code: CHEM136**

**Course Objectives:** The objective of the course is to give the students a general view on the industrial applications of chemistry in field of water technology, fuel quality, effect of corrosion and measures for control and usage of lubricants and polymers. It also gives a basic knowledge of instrumental methods to identify the structure of compounds.

**Pre-requisites:** Basic knowledge of Chemistry in school level

**Course Contents/Syllabus:**

|  |  |
| --- | --- |
|  | **Weightage (%)** |
| **Module I : Water Technology** |  |
| **Descriptors/Topics**   * Introduction and specifications of water, * Hardness and its determination (EDTA method only), Alkalinity * Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, caustic embrittlement & corrosion : causes & prevention, * Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment, * Water softening processes : Lime – soda process, Zeolite, Ion exchange method, * Water for domestic use. |
| **Module II: Fuels** |  |
| **Descriptors/Topics**   * Classification, calorific value of fuel, (gross and net), * Determination of calorific value of fuels, bomb calorimeter and its corrections, theoretical determination of Calorific value * Solid fuels - Proximate and ultimate analysis, * Knocking-Octane and Cetane rating * Numerical on combustion |
| **Module III: Instrumental Methods of analysis** |  |
| **Descriptors/Topics**   * Introduction; Principles of spectroscopy; Laws of absorbance * IR : Principle, Instrumentation, Application * UV : Principle, Instrumentation, Application * NMR : Principle, Instrumentation, Application |
| **Module IV : Corrosion** |  |
| **Descriptors/Topics**   * Introduction, Mechanism of dry and wet corrosion, * Types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity. * Factors influencing corrosion. * Corrosion control |
| **Module V: Polymers and Lubricants** |  |
| **Descriptors/Topics**   * Polymers: Introduction, Classification, Mechanism of polymerization-Addition (Free radical, anionic, cationic) and Condensation, Molecular weight of polymers-number average and weight average, Preparation property and uses: PMMA, Polyester, Bakelite, Epoxy resin, Nylon 66. * Lubricants: Introduction; Mechanism of Lubrication; Types of Lubricants, Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point. * Application of Chemistry in Engineering. |

**Course Learning Outcomes:**

The student will be able to

* Understand the various water treatment processes for water quality monitoring.
* Categorize the types of fuels and calculate calorific value based on fuel composition
* Apply a suitable control method to combat corrosion in daily life
* Describe the lubricants and polymers based on their properties for a particular application.
* Interpret and evaluate the structure of molecules based on the spectral data.

**Pedagogy for Course Delivery:**

The course pedagogy will follow the four quadrant approach i.e. using e-content like audio visual aids, video lectures, presentations, open source reference material, discussions on applications of topics covered. Assessment will be done through assignments, performance and viva/ quiz on topics covered after completion of modules.

**List of Professional Skill Development Activities (PSDA):**

1. **Lab Safety Skills**
2. **Analysis of ongoing research or any topic through Group Discussion**
3. **Guest lecture by expert**

**Lab/ Practicals details, if applicable:**

**List of Experiments:**

* To determine the ion exchange capacity of a given cation exchanger.
* To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.
* To determine the type and extent of alkalinity of given water sample.
* Determination of amount of oxalic acid and H2SO4 in 1 L of solution using N/10 NaOH and N/10 KMnO4 solution.
* To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.
* (a) To find the cell constant of conductivity cell.

(b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically

* Determination of Dissolved oxygen in the given water sample
* To determine the total residual chlorine in water.
* Determination of viscosity of given oil by means of Redwood viscometer I.
* To determine flash point and fire point of an oil by Pensky Martin’s Apparatus
* To determine the number of water molecules of crystallization in Mohr’s salt.

**Assessment/ Examination Scheme:**

|  |  |
| --- | --- |
| **Theory L/T (%)** | **Lab/Practical/Studio (%)** |
| **80** | **20** |

**Theory Assessment (L&T):**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Continuous Assessment/Internal Assessment**  **(\_\_40\_\_ %)** | | | | | **End Term Examination**  **(\_\_60\_%)** |
| **Components (Drop down)** | **CT** | **HA** | **Quiz 1/ Quiz 2/ Quiz 3** | **ATT** |  |
| **Linkage of PSDA with Internal Assessment Component, if any** | **-** | **-** | **Quiz 3** | **-** |  |
| **Weightage (%)** | **10** | **10** | **5+5+5** | **5** | 60 |

**Lab/ Practical/ Studio Assessment:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Continuous Assessment/Internal Assessment**  **(\_\_40\_\_ %)** | | | | **End Term Examination**  **(\_\_60\_\_ %)** | | |
| **Components (Drop down** | **LR** | **P** | **V** | **ATT** | EX | V |  |
| **Weightage (%)** | 10 | 10 | 15 | 5 | 30 | 30 |  |

**Text Reading & References:**

**(For Theory)**

* Engineering Chemistry- Jain and Jain
* Engineering Chemistry- Sunita Rattan
* Engineering Chemistry-Shashi Chawla
* Engineering Chemistry –Dara and Dara
* Textbook of engineering chemistry- Tinku Basu and Christine
* Spectroscopy- Y.R Sharma
* Corrosion Engineering – Fontenna and Greene
* Theory and Practices in Chemistry- Narula & Virmani
* Experiments in Applied Chemistry- Sunita Rattan, Kataria & Sons
* Experimental Chemistry-Shashi Chawla ,Dhanpat Rai Publications
* Comprehensive Experimental Chemistry, V. K. Ahluwalia, New Age Publication, Delhi

**Additional Reading:** Research papers on latest developments related to water, fuels, lubricants and corrosion.

**Any other Study Material:** e-Content and Supplementary material available on Amizone

**Mapping Continuous Evaluation components/PSDA with CLOs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bloom’s Level > | Remembering | Understanding | Applying | Analysing | Evaluating | Creating |
| Course Learning Outcomes  Assessment type/PSDA | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO 5 |
| Class Test | √ | √ | √ | √ |  | √ |
| Home Assignment | √ |  | √ |  | √ |  |
| Quiz | √ | √ |  |  |  | √ |
| Performance in Lab |  |  |  | √ |  | √ |
| Lab record |  | √ | √ |  | √ |  |
| Viva | √ | √ | √ | √ |  |  |