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| **Course No.**  | **:** | **REE 111** | **Course Title** | **:** | **Engineering Chemistry** |
| **Semester** | **:** | **I** | **Credits** | **:** | **2(1+1)** |

**Syllabus:**

**Theory**

Phase rule and its application to one and two component systems. Fuels: classification. calorific value. Colloids: classification. properties. Corrosion: causes. types and method of prevention. Water: temporary and permanent hardness. disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion. Analytical methods like thermo-gravimetric. polarographic analysis. nuclear radiation. detectors and analytical applications of radioactive materials. Enzymes and their use in the manufacturing of ethanol and acetic acid by fermentation methods.Principles of food chemistry.Introduction to lipids, proteins, carbohydrates, vitamins, colouring and flavouring reagents of food. Lubricants: properties. mechanism. classification and tests. Polymers.types of polymerization. properties. uses and methods for the determination of molecular weight of polymers. Introduction to IR spectroscopy.

**Practical**

Determination of temporary and permanent hardness of water by EDTA method: Estimation of chloride in water: Estimation of dissolved oxygen in water: Determination of BOD in water sample: Determination of COD in water sample: Estimation of available chlorine in bleaching powder: Determination of viscosity of oil: Estimation of activity of water sample: Estimation of alkalinity of water sample: Determination of carbonate and non- carbonate hardness by soda reagent: Determination of coagulation of water and chloride ion content: Determination of specific rotation of an optically active compound: Determination of Xnax and verification of Beer Lambert Law: Determination of calorific value of fuel: Identification of functional groups (alcohol, aldelyde, ketones, carboxylic acid and amide) by IR: Chromatographic analysis: Determination of molar refraction of organic compounds.

**Teaching Schedule:**

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| **Lect No** | **Topics to be covered** | **Book No** | **Chapter No** | **Article no** | **Page no** |
| 1 | **Fuels: classification. Calorific value.** Fuel –definitionClassification of fuelsCalorific value Characteristics of a good fuelComparison between solid, liquid and gaseous fuels.Solid fuels: wood , coal | 1 | 2 | 2.12.22.32.42.52.9 -2.10 | 7373747575-7681 |
| 2-3 | Classification of coal by rankPeat, Lignite , Bituminous, AnthraciteAnalysis of coalSolved ProblemNo.9Unsolved problems No. 24 &25Gross and Net calorific ValueDetermination of CV by Bomb CalorimeterTheoretical calculations of CV of a fuelSolved problems No. 1-5Un-solved Problems No.1,3,4,7,22,23 | 1 | 2 | 2.112.132.62.62.8 | 81-8284-86118-11913178-8076-7980128128-130 |
| 4 | Liquid fuels Petroleum Classification of Petroleum Origin of Petroleum( modern theory only)Refining of crude oilCracking-thermal cracking. | 1 | 2 | 2.182.18 | 9191929293-95 |
| 5-6 | Gaseous fuel( Definition, composition and uses only)Natural gasCoal gasOil gasProducer gasWater gasBio gasDetermination of CV of gas by Junkers gas CalorimeterFlue gas analysis by Orsat’s apparatus | 1 | 2 | 2.282.282.292.302.312.322.332.36 | 106106106107108109110113113-115 |

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| 7-9 | **Corrosion: causes, types and method of prevention.**Introduction: DefinitionGravity of corrosion problemsDry or chemical corrosion (Definition only)Wet or electrochemical corrosionGalvanic corrosionConcentration cell corrosionPassivity | 1 | 6 | 6.16.26.36.56.66.7 | 351351-352352353357358360 |
| 10-11 | Underground or soil corrosionPitting corrosionInter granular corrosionWaterline corrosionStress corrosionMicrobiological corrosionErosion corrosionCorrosion control( protection against corrosion) methods in short | 1 | 6 | 6.86.96.106.116.126.136.146.17 | 360361361362363364365369-374 |
| 12 | **Water: temporary and permanent hardness. disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion.**Hardness of water: temporary & permanentDisadvantages of hard water | 1 | 1 | 1.51.6 | 4-55 |
| Scale and sludge formation in boilersDisadvantages of sludge formationDisadvantages of scale formationBoiler corrosion |  |  | 1.71.71.71.9 | 66710-11 |
| 13-14 | **Lubricants: properties. mechanism. classification and tests.**LubricantsFunctions of lubricantsMechanism of lubricationClassification of lubricantsLubricating oils | 1 | 18 | 18.218.318.418.5 | 721721721-723723723 |
| 15-16 | Greases or semi –solid lubricantsSolid lubricantsProperties of lubricating oils Viscosity, Viscosity Index , Flash & Fire point, OilinessCloud and pour point, Emulsion, Volatility, Carbon residue etc.Solved examples(1,2 &3)Unsolved examples(1,2&3) | 1 | 18 | 18.618.718.1018.10 | 726727729-733733-737741742 |

**Practical Exercise:**

1. Determination of viscosity of oil:
2. Estimation of alkalinity of water sample:
3. Determination of carbonate and non- carbonate hardness by soda reagent:
4. Determination of coagulation of water and chloride ion content:
5. Determination of specific rotation of an optically active compound:
6. Determination of Xnax and verification of Beer Lambert Law:
7. Determination of calorific value of gaseous fuel:
8. Determination of various properties of water: Hardness/TDS,Na,Cl.MgCO3,Ph
9. Ulltimate analysis of selected biomass
10. Proximate analysis of selected biomass
11. Determination of Fire point and Flash point of liquid fuel

**Suggested Reading**

1. Jain P L and Jain M. 1994. Engineering Chemistry. DanpatRai publishing company Pvt. Ltd., Delhi.
2. Bahl B S, ArunBahl and Tuli B D. 2007. Essentials of Physical Chemistry. S.Chand and Co. Ltd., Delhi.
3. M. Swaminathan, 1993. Hand Book of Food and Nutrition. Bangalore Printing and Publishing Co. Ltd., No. 88, P.B. No. 1807, Mysore Road, Bangalore-560018
4. Shubhangini A. Joshi. Nutrition and Dietetics. Tata McGraw-Hill Publishing Company Limited, New Delhi. (2nd Edition)
5. S. N. Mahindru, 2009. Food Science & Technology. A P H Publishing Corporation 4435-36/7, Ansari Road, Darya Ganj, New Delhi-110002.