

| Course Code | Course Name | Teaching Scheme (Contact Hours) | | | Credits Assigned | | | |
|-------------|-----------------------|---------------------------------|--------|------|------------------|----------|------|-------|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC103 | Applied Chemistry – I | 03 | 01 | -- | 03 | 0.5 | -- | 3.5 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|-------------|-----------------------|---------------------|-------|------------------|--------------|-----------|-------|------|-------|
| | | Theory | | | | Term Work | Pract | Oral | Total |
| | | Internal Assessment | | | End Sem Exam | | | | |
| | | Test1 | Test2 | Av of Test 1 & 2 | | | | | |
| FEC103 | Applied Chemistry – I | 15 | 15 | 15 | 60 | 25 | -- | -- | 100 |

Objectives

1. To provide necessary background in applied chemistry relevant to chemical industries.
2. To provide exposure in conducting experiments and interpret and report the results in professional format.

Outcomes: Learner will be able to...

1. Apply the knowledge of types of hardness of water and its estimation.
2. Apply the knowledge of various softening and disinfecting methods.
3. Apply the knowledge of various polymers, their synthesis, properties and uses along with their fabrication techniques.
4. Apply the knowledge of thermodynamics in studying different chemical systems in equilibrium obeying Gibb's phase rule.
5. Apply the knowledge of lubricants, types, properties and mechanisms to avoid frictional resistance.
6. Demonstrate the knowledge of Portland cement and carbon nanomaterials.

| Module | Detailed Contents | Hrs. |
|--------|--|------|
| 01 | Water Impurities in water, Hardness of water, Determination of Hardness of water by EDTA method and problems, Softening of water by Hot and Cold lime Soda method and numerical problems. Zeolite process and numerical problems. Ion Exchange process and numerical problems. Potable water standard as per BIS w.r.t. i) pH, ii) Alkalinity, iii) TDS, iv) Hardness; Drinking water or Municipal water -Treatments removal of microorganisms by adding Bleaching powder, Chlorination (no breakpoint chlorination), Disinfection by Ozone, Electrodialysis, Reverse osmosis, and Ultra filtration. BOD, COD- definition & significance, sewage treatment (only activated sludge process), Numerical problems related to COD. | 12 |
| 02 | Polymers Introduction to polymers, Classification, Types of polymerization, Thermoplastic and Thermosetting plastic; Compounding of plastic, Fabrication of plastic by Compression, Injection, Transfer and Extrusion moulding. Preparation, properties and uses of Phenol formaldehyde, PMMA, Kevlar. Effect of heat on the polymers (Glass transition temperature), Viscoelasticity. Conducting polymers, Engineering Plastics, Polymers in medicine and surgery. Rubbers : Natural rubber- latex, Drawbacks of natural rubber, Vulcanization of rubber, Preparation, properties and uses of Buna-S, Silicone and Polyurethane rubber. | 12 |
| 03 | Lubricants Introduction, Definition, Mechanism of lubrication, Classification of lubricants, Solid lubricants (graphite & Molybdenum disulphide), Semisolid lubricants, Liquid lubricants, Additives in blended Oils. Important properties of lubricants - Definition and significance of - Viscosity, Viscosity index, Flash and fire points, Cloud and pour points, Oiliness, | 07 |

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|-----------|--|-----------|
| | Emulsification, Acid value and numerical problems, Saponification value and numerical problems. | |
| 04 | Phase Rule Gibb's Phase Rule, Terms involved with examples, One Component System (Water), Reduced Phase Rule, Two Component System (Pb- Ag), Advantages and Limitations of Phase Rule. | 04 |
| 05 | Important Engineering Materials Cement – Manufacture of Portland Cement, Chemical Composition and Constitution of Portland Cement, Setting and Hardening of Portland Cement, Concrete, RCC and Decay. Nanomaterials, preparation (Laser and CVD) method, properties and uses of CNTS, Fullerene - properties and uses. | 05 |

Suggested Experiments:

- 1) To determine total, temporary and permanent hardness of water sample.
- 2) Removal of hardness using ion exchange column.
- 3) To determine acid value of a lubricating oil.
- 4) To determine free acid pH of different solutions using pHmeter
- 5) To determine metal ion concentration using colorimeter.
- 6) To determine flash point and fire point of a lubricating oil
- 7) To determine Chloride content of water by Mohr's Method.
- 8) To determine melting point and /or glass transition temperature of a polymer
- 9) Molecular weight determination of polymers by Oswald Viscometer.
- 10) To determine the percentage of lime in cement.
- 11) Hardening and setting of cement using Vicat's apparatus
- 12) Determination of Viscosity of oil by Redwood Viscometer.

Term Work shall consist of minimum five experiments. The distribution of marks for term work shall be as follows:

- | | | |
|---|---|------------|
| 1 | Attendance (Practical and Theory) | : 05 marks |
| 2 | Laboratory Work (Experiments and journal) | : 10 marks |
| 3 | Assignments and Viva on practical's | : 10 marks |

Assessment:

Internal Assessment Test:

Assessment consists of two class tests of 15 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 35% syllabus is completed. Duration of each test shall be one hour.

End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 15 marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub-questions of 3 marks will be asked.
4. Remaining questions will be mixed in nature.(e.g. Suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

References:

1. Engineering Chemistry - Jain& Jain (DhanpatRai)
2. Engineering Chemistry – Dara&Dara (S Chand)
3. Engineering Chemistry - Wiley India (ISBN – 9788126519880)
4. A Text Book of Engineering Chemistry – Shashi Chawla (DhanpatRai)