ENGINEERING CHEMISTRY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER - I/II

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>17CHE12/17CHE22</th>
<th>IA Marks</th>
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<tbody>
<tr>
<td>Number of Lecture</td>
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<td>Exam Marks</td>
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<td>Hours/Week</td>
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<tr>
<td>Lecture Hours</td>
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CREDITS - 04

Course objectives:
To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

- Electrochemistry & Battery Technology.
- Corrosion & Metal Finishing.
- Fuels & Solar energy.
- Polymers.
- Water Technology & Nano Materials.

Module -1

Electrochemistry and Battery Technology


Battery Technology: Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency, cycle
life and shelf life. Construction, working and applications of Zinc-Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO$_2$ and Li-ion batteries.

**Fuel Cells**: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H$_2$SO$_4$ electrolyte.

### Module -2

**Corrosion and Metal Finishing:**


**Metal Finishing**: Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt’s Bath) and Chromium(decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

### Module - 3

| 10hours |
**Fuels and Solar Energy:**

**Fuels:** Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti knocking agents, power alcohol & biodiesel.


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<th>Module - 4</th>
<th>10 hours</th>
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**Polymers:**

**Module-5**

**Water Technology and Nanomaterials:**

| Water Technology: Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved \(O_2, CO_2\) and \(MgCl_2\)). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis & electro dialysis (ion selective). |
|---|---|---|

### Course outcomes:

On completion of this course, students will have knowledge in:

- Electrochemical and concentration cells. Classical & modern batteries and fuel cells.
- Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electro less plating.
- Production & consumption of energy for industrialization of country and living standards of people. Utilization of solar energy for different useful forms of energy.
- Replacement of conventional materials by polymers for various applications.
- Boiler troubles; sewage treatment and desalination of sea water, and
- Over viewing of synthesis, properties and applications of nanomaterials.
Question paper pattern:
- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions(with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books: