**OPEN ELECTIVE-2 Industrial Chemistry**

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| Semester | I |
| Paper Code | CHOE-II |
| Paper title | Industrial Chemistry |
| Number of teaching hrs per week | 3 |
| Total number of teaching hrs per semester | 42 |
| Number of credits | 3 |

**Course Objective:** The objective of this course is to educate non-chemistry and chemistry students about the fascinating aspects of making, using of products routinely used by common man.

**Course Outcomes:** On completion of this course students will be able to

* Appreciate the vastness of applications of chemistry in industry and society.
* Gain knowledge of industrial materials used in daily life.
* Learn processing and refining of ores.
* Understand the meaning of renewable and non-renewable sources such as biofuels and petroleum.
* Learn about the fast-advancing field of nanotechnology.
* Gain knowledge on various surface coating materials and dyeing processes.

**Content of open elective-2**

**Nanotechnology (8 h)**

**(a) Introduction to Nanoscience** Definition, nano domain, properties and synthesis of nanomaterials, types of nanoparticles. **(b) Applications of nanomaterials**

i) Medicine-gold sol, antibacterial materials - AgO ii) photo voltaic cell (in solar cells) iii) self-cleaning glasses - ZnO, SnO, TiO v) catalytic material vi) super capacitors, Fabrics and electronics.

**Water chemistry (3 h)**

Principles and applications of aqueous chemistry, water quality parameters and standards, hardness of water. Uses of zeolites in removal of hardness of water.

**Explosives and propellants (3 h)**

**(a) Explosives** – classification, requirements of explosives and applications.

**(b) Propellants** - characteristics, classification and applications.

**Fuel Reserves: Renewable and Non-renewable Sources (9 h)**

**(a) Petroleum, petrochemicals and Coal**

Origin of petroleum, composition, refining of petroleum, fractional distillation, octane number, cetane number, petrol, diesel, kerosene, naptha, lubricants, LPG, synthetic petrol, applications of petrochemicals. Characteristics, classification, calorific value, coal varieties, reserves in India, coke, gaseous fuels.

**(b) Biofuels**

Biofuels-types, advantages, bioethanol, biodiesel, biogas- preparation and applications.

**Pigments, paints and dyes (5** **h)**

**(a) Pigments**- types of pigments-natural pigments, synthetic pigments, reactive pigments. Paints - definition, classification of paints, constituents of paints, requirements of a good paint, manufacture of paints, purpose of painting.

**b) Dyes** - sensation of colors, chromophore, auxochrome, classification of dyes-acid dyes, base dyes, direct dyes, mordant dyes, vat dyes. Dyeing, factors affecting dyeing process.

**(c)Varnishes:** Types and constituents.

**Industrial materials (10 h)**

Refractories: properties, classification, determination of PCE values.

Abrasives: Classification, applications, Moh’s hardness scale and manufacture. Glass: properties, types, composition, raw materials, varieties of glass - borosilicates, optical, safety glass, fire and bullet proof glasses composition and uses. Cement: raw materials, manufacture of portland cement, setting of cement.

Ceramics: Raw materials and their role, varieties of clay, production of ceramic ware, glazing, insulators.

Steel: Alloy steels - influence of Si, Mn, Cr, Ni, Ti and W on the properties of steel. Ferro alloys- Uses and production of ferrochrome, ferromanganese and ferrosilicon. Heat treatment of steel - hardening, tempering, annealing, case hardening - carbiding and nitriding. Steel industries in India.

Contribution of Chemical Industries to the economy of India.

**Metallurgy (4 h)**

**(a) Introduction to Metallurgy:** Occurrence of metals in nature, minerals and ores, general principles of metallurgy.

**(b) Separation of ores and Refining of metals -** concentration of the ore – gravity separation, froth floatation process, refining of metals – general overview of refining methods (electrolytic, vapour phase and zone).

**References**

1. E. Stocchi: Industrial chemistry, Vol 1, Ellis Horwood Ltd. UK, 1990.

2. B.K. Sharma and H. Gaur, Industrial Chemistry, Goel Publishing House, 1996.

3. B.K. Sharma, Industrial Chemistry including chemical engineering, Goel Publishing House, 2000**.**

**Pedagogy:** ICT tools, Chalk & Talk, Models & Charts.

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| **Formative Assessment (Internal assessment) Theory** | |
| **Assessment Occasion/ type** | **Weightage in Marks** |
| Continuous evaluation and class test | 20 |
| Seminars/Class work | 10 |
| Assignments/Discussions | 10 |
| **Total** | 40 |