

# Vidyasagar University

## Curriculum for Industrial Chemistry (Major) [Choice Based Credit System]

### Semester-I

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC1		C1T: Unit Process for Organic Synthesis and Industrial Applications	Core Course-1	5	1	0	6	75
CC2		C2T: Inorganic Materials for Chemical Industries and Industrial Waste Management	Core Course-2	5	1	0	6	75
GE1		TBD	Generic Elective-1				4/5	75
						2/1		
AECC		English	AECC (Elective)	1	1	0	2	50
<b>Semester Total</b>							<b>20</b>	<b>275</b>

L=Lecture, T=Tutorial, P=Practical, CC- Core Course, TBD - To be decided, AECC- Ability Enhancement Compulsory Course

**Generic Elective (GE)** (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: **Computer Science/Mathematics/Physics/Chemistry/Economics**

**Modalities of selection of Generic Electives (GE):** A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (GE) of a subject or discipline specified for the relevant semester.

**Semester –I**  
**Core Course (CC)**

**CC-1 : Unit Process for Organic Synthesis and Industrial Applications**

**Credits 06**

**C1T : Unit Process for Organic Synthesis and Industrial Applications**

**Course Contents:**

**Nomenclature Generic name, trade name. Raw Material Resources:**

Cellulose, Starch Properties, Modification, Important Industrial Chemical derived from them, alcohol and alcoholbased chemical, Oxalic acid,

**Unit Process in Organic Chemical Manufacture Nitration:**

Introduction – Nitrating agents, Kinetic and mechanism of nitration process such as nitration of –

- a) Paraffinic hydrocarbons
- b) Benzene to Nitrobenzene and m-dinitrobenzene
- c) Chlorobenzene to O-& P-nitrobenzene
- d) Acetanilide to P-nitroacetanilide
- e) Toluene, Continuous vs. batch nitration

**Halogenations:**

Introduction-kinetics of halogenations reactions. Reagents for halogenations, halogenations of aromatics-side chain and nuclear halogenations, Commercial Manufactures-chlorobenzenes, chloral, monochloroacetic and chloromethane, dichlorofluoromethane.

**Sulphonation:**

Introduction-sulphonating agents, Chemical and physical factors in sulphonation, Kinetics and mechanism of sulphonation reaction, commercial sulphonation of benzene, naphthalene, alkyl benzene, Batch vs. continuous sulphonation.

**Unit Processing in Organic Synthesis**

**Oxidation:**

Introduction-Types of oxidation reactions, Oxidizing agents, Kinetics and mechanism of oxidation of organic compounds, Liquid phase oxidation, vapour phase oxidation, Commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.

**Hydrogenation :**

Introduction-Kinetics and thermodynamics of hydrogenation reaction, Catalysts of hydrogenation reaction, Hydrogenation of vegetable oil, Manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acids to alcohols, catalytic reforming.

**Alkylation:**

Introduction, Types of alkylation, alkylating agents, thermodynamic and mechanism of alkylation reactions, Manufacture of alkyl benzenes (for detergent manufacture), ethyl benzene, phenyl ethyl alcohol, (N-alkyl anilines mono and di-methyl and ethyl anilines).

**Esterification:** Introduction, Hydrodynamics and kinetics of esterification reaction, esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivatives, commercial manufacture of ethyl acetate, dioctyl phthalate, vinyl acetate, cellulose acetate.

**Amination:**

- a) By Reduction: Introduction, Method of reduction-metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal and alkali sulfites, metal hydrides, sodium metal, concentrate caustic oxidation, reduction, commercial manufacture of aniline, m-nitro aniline, p-amino phenol.
- b) By Aminolysis : Introduction, Alkylating agents, Kinetics, thermodynamics and mechanism of hydrolysis.

**CC-2: Inorganic Materials for Chemical Industries and Industrial Waste Management****Credits 06****C2T:** Inorganic Materials for Chemical Industries and Industrial Waste Management**Course Contents:****Material Science:**

Mechanical properties of materials and change with respect to temperature. Materials of constructions used in industry.

**Metals and alloys:**

Important metals and alloys, Iron, Copper, Aluminum, Lead, Nickel, Titanium and their alloys phase diagram Mechanical and chemical properties and their applications.

**Cement:**

Types of cement, composition, manufacturing process setting of

**Ceramics:**

Introduction, Types, manufacturing process, applications, refractoriness, concept of bio ceramics.

**Polymeric Materials:**

Commodity polymers, blends and composites their constitution, chemical and physical properties, industrial applications.

**Glass:**

Types, composition, manufacture, physical and chemical properties, Industrial applications.

**Corrosion:** Various types of corrosion relevant to chemical industry mechanism, preventive methods.

### **Effluent Treatment and Waste Management**

Principles and equipments for aerobic, anaerobic treatment, absorption, filtration, sedimentation. Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers. Absorbers. Solid waste Management. Industrial Safety Laws.

### **Industrial Aspects of Inorganic Chemistry**

#### **Basic Metallurgical Operations:**

Pulverization, Calcinations, Roasting, Refining. Physicochemical principles of extraction of Iron, Copper, Lead, Silver, Sodium, Aluminum, Magnesium, Zinc, Chromium. Inorganic Materials of Industrial Importance : Their availability, forms, structure and modification, Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.