

# **VIDYASAGARUNIVERSITY**

Midnapore, West Bengal



*PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF*

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**BACHELOR OF SCIENCE (HONOURS)  
MAJOR IN INDUSTRIAL CHEMISTRY**

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**4-YEAR UNDERGRADUATE PROGRAMME**

*(w.e.f. Academic Year 2023-2024)*

*Based on*

**Curriculum & Credit Framework for Undergraduate Programmes**

**(CCFUP), 2023 & NEP, 2020**

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VIDYASAGAR UNIVERSITY, PASCHIM MIDNAPORE, WEST BENGAL

**VIDYASAGAR UNIVERSITY**  
**BACHELOR OF SCIENCE (HONOURS) MAJOR IN INDUSTRIAL CHEMISTRY**  
**(under CCFUP, 2023)**

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks			
								CA	ESE	TOTAL	
B.Sc. (Hons.)	1 <sup>st</sup>	I	<b>SEMESTER-I</b>								
			Major-1	INCHMJ101	T: Unit Process for Organic Synthesis and Industrial Applications	4	4-0-0	15	60	75	
			SEC	INCSEC01	P: Chemistry of Cosmetics & Perfumes.	3	0-0-3	10	40	50	
			AEC	AEC01	Communicative English -1 ( <i>common for all programmes</i> )	2	2-0-0	10	40	50	
			MDC	MDC01	Multidisciplinary Course -1 ( <i>to be chosen from the list</i> )	3	3-0-0	10	40	50	
			VAC	VAC01	ENVS ( <i>common for all programmes</i> )	4	2-0-2	50	50	100	
			Minor-1 (Disc.-I)	MI01	<i>To be decided (To be taken from other Discipline)</i>	4	3-0-1	15	60	75	
		<b>Semester-I Total</b>						20			400
		II	<b>SEMESTER-II</b>								
			Major-2	INCHMJ102	T: Inorganic Materials for Chemical Industries and Industrial Waste Management	4	4-0-0	15	60	75	
			SEC	INCSEC02	P: Medicinal & Pharmaceutical chemistry.	3	0-0-3	10	40	50	
			AEC	AEC02	MIL-1 ( <i>common for all programmes</i> )	2	2-0-0	10	40	50	
			MDC	MDC02	Multi Disciplinary Course-02 ( <i>to be chosen from the list</i> )	3	3-0-0	10	40	50	
			VAC	VAC02	Value Added Course-02 ( <i>to be chosen from the list</i> )	4	4-0-0	10	40	50	
			Minor-2 (Disc.-II)	MI02	<i>To be decided (To be taken from other Discipline)</i>	4	3-0-1	15	60	75	
			Summer Intern.	CS	Community Service	4	0-0-4	-	-	50	
		<b>Semester-II Total</b>						24			400
		<b>TOTAL of YEAR-1</b>						44			800

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, VAC = Value Added Course; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language, ENVS = Environmental Studies

## MAJOR (MJ)

**MJ-1: Unit Process for Organic Synthesis & Industrial Applications**      **Credits 04**  
(Full Marks: 75)

**MJ-1T: Unit Process for Organic Synthesis & Industrial Applications**      **Credits 04**

### Course contents:

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

Cellulose, Starch Properties, Modification, Important Industrial Chemical derived from them, alcohol and alcohol based 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, alogenations of aromatics-side chain and nuclear halogenations, Commercial Manufactures - chlorobenzenes, chloral, monochloroacetic acid and chloromethane, dichlorofluoromethane.

#### **Sulphonation:**

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

### **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, Animating agents, Kinetics, thermodynamics and mechanism of hydrolysis.

**MJ-2: Inorganic Materials for Chemical Industries and Industrial Waste Management****Credits 04 (Full Marks: 75)****MJ-2T: Inorganic Materials for Chemical Industries and Industrial Waste Management****Credits 04****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 phen 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.

**MINOR (MI)**

***TO BE DECIDED (SELECTED FROM OTHER DECIPLINES)***

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**SKILL ENHANCEMENT COURSE (SEC)**

**SEC 1: Chemistry of Cosmetics & Perfumes**

**Credits 03**

**SEC1P: Chemistry of Cosmetics & Perfumes**

**Full Marks: 50**

**Course Outline:**

**Part-A:**

- i. Preparation of talcum powder.
- ii. Preparation of shampoo.
- iii. Preparation of enamels.
- iv. Preparation of hair remover.
- v. Preparation of face cream.
- vi. Preparation of nail polish and nail polish remover.
- vii. Preparation of Lipstick.

**Any other preparation as per the instruction of respective College**

**Part-B: Field visit and submission of the Report**

**Suggested Readings:**

1. Stocchi, E. Industrial Chemistry, Vol, Ellis Horwood Ltd. UK (1990). Jain,
2. P.C. & Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi. Sharma,
3. B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).

**SEC 2: Medicinal & Pharmaceutical Chemistry**

**Credits 03**

**SEC 2P: Medicinal & Pharmaceutical Chemistry**

**Full Marks: 50**

**Part-A: Extraction**

- i) Extraction of eucalyptus leaf ingredient
- ii) Extraction of eugenol from clove
- iii) Extraction of nicotine from tobacco.
- iv) Curumine from turmeric
- v) Extraction of caffeine from tea/coffee

**Part-B: A project:** Collection and brief introduction of at least 10 herbal plants

**Suggested Readings:**

1. Patrick, G. L. Introduction to Medicinal Chemistry, Oxford University Press, UK, 2013.
2. Singh, H. & Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Pitampura, New Delhi, 2012.
3. Foye, W.O., Lemke, T.L. & William, D.A.: Principles of Medicinal Chemistry, 4th ed., B.I. Waverly Pvt. Ltd. New Delhi.