



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Science College  
Semester-2(M.SC.IC.)

**Subject:** Petrochemical and Polymer-MSCIN12509

**Type of course:** Major

**Prerequisite:** Students should have a basic knowledge of petrochemicals and polymers are primarily based on organic compounds (especially hydrocarbons). A strong understanding of organic reactions, functional groups, and isomerism is essential.

**Rationale:** To understand Job Creation and Industrial Growth: The petrochemical and polymer industries are large employers, involving millions of workers worldwide. The growth of these industries directly supports the global economy by creating jobs in manufacturing, research, logistics, and even consumer products.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*





**Course Content:**

Unit No.	Course content	Hrs	% Weight age
1	<b>Petrochemicals</b> Building Blocks for Petrochemicals, their separation and purification. Manufacturing of specific hydrocarbon derivatives with special emphasis on: C1, C2, C3, C4 & Aromatic hydrocarbons.	15	25
2	<b>Manufacturing &amp; Industrial applications of</b> Methanol, Formaldehyde, Acetylene, Ethylene, Polypropylene, Vinyl chloride, Perchloro ethylene, Ethylene dichloride, Ethanol amine, Trichloro ethylene. Acrylonitrile, Isopropanol, Maleic acid, butadiene, Acetone, Isoprene, Ethylene oxide, Toluene, Phenol, Phthalic anhydride.	15	25
3	<b>Thermoplastic polymer</b> Brief introduction of physical properties, chemical properties, manufacturing, process and applications of, HDPE, Polypropylene, polyvinylchloride, Teflon, polystyrene, Vinyl acetate, Polyvinyl alcohol, Cellulosic fiber, Viscose rayon, Nylon-6, Nylon-6, 6, Terylene, Saran, Vinyon, Orlan.	15	25
4.	<b>Thermosetting polymers</b> synthesis chemical properties and applications of Phenol formaldehyde, Urea formaldehyde, Melamine resins, polyurethanes, epoxy resins, <b>Elastomers or Rubber</b> Vulcanization and compounding Buna-S (SBR), Neoprene, Buna-N (NBR)	15	25
	<b>Total</b>	60	100

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1.	<b>Flowchart</b> Students will create a flowchart or process diagram that outlines the steps in the separation and purification of raw materials (like naphtha, natural gas, or crude oil) into key hydrocarbon building to understand the separation and purification processes involved in petrochemical production. Upload it on GMIU Web portal.	10





2.	<b>Case Study: Industrial Application of Derivatives</b> Students review real-world case studies or videos of industrial facilities that manufacture petrochemical derivatives (e.g., polypropylene production from propylene, PVC from ethylene, or formaldehyde from methanol). They then present a report analyzing the raw materials, production methods, and applications (e.g., formaldehyde in plastics, adhesives, and automotive parts). Upload the details on GMIU Web portal.	10
3.	<b>Everyday Polymer</b> Students need to identify products which are made of polymer and used in day to day life. List out at least 25 examples and upload it to GMIU web Portal.	10
4.	<b>Polymer Model Building</b> Provide students with templates or instructions to create paper models representing different polymer structures And upload it to GMIU web Portal.	10
5.	<b>Polymer Properties Analysis</b> Faculty will assign students a specific thermoplastic polymers (e.g., PVC, HDPE, Nylon-6, Teflon), and have them perform experiments (or research) on physical properties such as: Density: Measurement of polymer density. Thermal properties: Determine the melting point. Student must prepare the notes and submit it on GMIU Web portal.	10
<b>Total</b>		<b>50</b>

### Suggested Specification table with Marks (Theory):60

<b>Distribution of Theory Marks</b> (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	40%	00	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.





**Course Outcome:**

After learning the course the students should be able to:	
CO1	Describe hydrocarbon feed stocks used in petrochemical production.
CO2	Predict an understanding of the physical, chemical properties, manufacturing, and applications of polymers.
CO3	Interpret the properties and manufacturing processes of rubber.
CO4	Investigate and critique the real-world applications of petrochemicals and polymers.

**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] Shrev's Chemical Process Industries, -R. Norris Shreve, J.A. Brink, Jr.; McGraw-Hill Kogakusha
- [2] Industrial Chemistry, -Dr B.K. Sharma; Goel Publication house.
- [3] Roger's Industrial Chemistry, -C.C. Furnas; D. Van Nostrand company, Inc.
- [4] Industrial Chemistry, -William Thornton; John Wiley & Sons.

