GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Polymer Chemistry
(Code: 3312301)

Diploma Programmes in which this course is offered	Semester in which offered
Plastic Engineering	**First Semester**

1. RATIONALE

The plastic industry occupies a prominent position in the development of both industrially advanced and developing countries. Plastics are now becoming basic engineering material which is now replacing steel become of their unique properties and low cost. Knowledge of Basic polymer chemistry is essential to take up career in plastic technology. An attempt has been made to make students aware about the basic concepts of polymer chemistry applied for understanding the engineering application in the field of plastics.

2. LIST OF COMPETENCIES

i.. **Use basic concepts of organic chemistry in the field of plastic engineering**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	**150**
3	0	2	05	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; C – Credit;
ESE – End Semester Examination; **PA** - Progressive Assessment

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Sub-topics
Unit-1 **ORGANIC CHEMISTRY**	1.1Understand basic principles of organic chemistry. 1.2Identify bond types & different organic compounds. 1.3Understand configuration of Carbon.	1.Introduction 2.Periodic table and element structure(C, H, O, S, Cl, N, Si) 3.Types of Bond, Bond angle, Bond length, Bond energy, Electro negativity, Polar Bonds, Bond Polarity& Dipole moment 4.Carbon: Structure and configuration SP-I, SP-II, and SP-III. 5.Classifications of Hydro-Carbons. 6.Classifications of functional groups. 7.Nomenclatures of Organic Compounds (IUPAC).
Unit-2 **CONCEPTS OF MONOMER**	2.1Familiarize with different monomers & its functionality.	1.Basic concepts of Monomer 2.Types of Monomer 3.Functionality of Monomer 4.Purification of Monomer
Unit-3 **CONCEPTS OF POLYMER**	3.1Understand different types of polymer & its structure.	1.Basic concepts of Polymer. 2.Effect of functionality on Polymer Structure. 3.Chemical and geometric structure of polymer. Configuration and conformation, Linear, branched and cross-linked structure, Random, alternating, block and graft polymers, Stereo regular polymer. 4.Classification of Polymer based on: a.Structure b.Repeating unit c.Applications d.Source e.Nature and Processing
Unit-4 **POLYMERIZATION REACTIONS**	4.1Develop ability to understand polymerization reactions to produce polymer.	1.Addition Polymerization reactions: a.Free radical polymerization b.Ionic polymerization c.Co-ordination polymerization 2.Condensation Polymerization a.Poly condensation polymerization b.Poly addition polymerization 3.Rearrangements and Stereo Polymerization 4.Co-Polymerization a.Free radical polymerization b.Ionic polymerization c.Co-poly condensation polymerization

5. Suggested Specification Table with Hours and Marks (Theory)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Organic chemistry	12	09	04	03	16
2.	Concepts of monomer	05	05	03	02	10
3.	Concepts of polymer	09	08	07	05	20
4.	Polymerization reactions	16	10	08	06	24
	Total	**42**	**32**	**22**	**16**	**70**

Legends: R = Remembrance; U = Understanding; A = Application and above levels.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the minimum list of exercises/practical/experiments

Ex. No.	Unit No.	EXERCISES/PRACTICAL/EXPERIMENTS	Hours
1	1	To study about different configurations of carbon.	02
2	1	Identification of simple organic compounds containing C, H, O, N, S & Cl with melting point & boiling point.	04
3	2	To study about monomers(Hydrocarbons, chlorinated monomers)	04
4	2	To study about monomers with several double bonds	02
5	3	Identification of Polymers from Solubility Tests.	04
6	3	Identification of Polymers by Flame Tests.	02
7	3	Separation and Purification of Polymer.	04
8	4	To study about free radical polymerization.	02
9	4	The Condensation Polymerization Reaction Used in the Creation of Nylon 6-10	04

6. Suggested List of Students Activities

Following is the list of student activities.

S. No.	Activity No.	Details of student activity
1	1	Prepare student reports as asked in experiments.
2	2	Perform experiments as mentioned.
3	3	Visit the nearer polymer suppliers.

7. Suggested Learning Resources

(A)Suggested Learning Resources List of Books (in tabular form)

List of Books

S.No.	Title of Books	Author	Publication
1	Organic Chemistry	P.L.Soni	Sultan Chand & Sons
2	Textbook of Organic Chemistry	Bahl & Tuli	S. C. Chand & Co., New Delhi
3	Textbook of Polymer Science	Billmeyer Jr.	John wiley & sons, New York
4	Polymer Science	V.R.Govariker	New Age International Delhi
5	Polymer Science of Technology	Jod R. Fried	Prentice-Hall of India Pvt. Ltd., New Delhi
6	Textbook of Organic Chemistry	R.K.Bansal	New Age Publications
7	Polymer Science and Technology of Plastics & Rubber	Pramanoy Ghosh	Tata McGrow Hill
8	Polymer Chemistry	Seymour & Carraher	CRC Press
9	Polymer Chemistry	Arora & Singh	Anmol Publications Pvt.
10	Principles of Polymer Chemistry	A Ravve	Springer

(B) List of Major Equipment/Instruments/Machines

a.Chemicals, solvents
b.Purification set
c.Test tubes, 18 x 150 mm
d.Stirring rod, glass
e.Bunsen burner
f.Beaker, (50 mL, 250 mL)
g.Tongs or forceps
h.Ring stand and ring with wire gauze
i.Safety equipments (gloves, goggles etc)
j.Wooden stick
k.Styrofoam cup
l.Thermometer

m.Capillary tube

(C)List of Relevant Software/Learning Websites

1.www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm

2.http://www.ing.unisi.it/didattica/matdid/2187.pdf

3.www.ing.unisi.it/didattica/matdid/2187.pdf

4.http://www.liv.ac.uk/~js1/Chem378/VITAL%20COPY%20Handouts%20Lecture15_Rannard_Chem378.pdf

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty members from Polytechnic

- **Shri Ajay Amin**, Government Polytechnic, Ahmedabad

Coordinator & Faculty members from NITTTR, Bhopal

- **Dr .Ajnu Rawlley**, Professor, Applied Science Dept, NITTTR, Bhopal