

- Banwell C.N., McCash E.M., (2008) Fundamentals of Molecular Spectroscopy, Fourth Edition, Tata McGraw-Hill.

## SUGGESTIVE READINGS

- Tanaka T., (1999) Experimental Methods in Polymer Sciences, Academic Press.
- Silverstein R.M., (1991) Spectrometric identification of organic compounds, John Wiley.
- Macomber R.S., (2008) A complete introduction to NMR spectroscopy, Wiley-inter science.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

## GENERIC ELECTIVES (GE-3)

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/Practice		
<b>POLYMER AND ENVIRONMET</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>Class 12<sup>th</sup> with Physics, Chemistry</b>	<b>----</b>

### Learning objectives

The Learning Objectives of this course are as follows:

- To give understanding of basics of care to be taken while handling polymer products.
- To know the Safety and hazardous of their manufacturing processes.
- To impart Knowledge of the subject will help students to see the environmental impact of plastic and resin.
- To understand the current benefits and concerns surrounding the use of plastics and look to future priorities, challenges and opportunities.

### Learning outcomes

After studying this paper, students will be able to

- Explain the basics of environmental and safety issues in the chemical industry.
- Apply the safety in handling monomer and resins

- Demonstrate the final product of polymer in environment after use and its waste management

## **SYLLABUS OF GE-3**

### **THEORY COMPONENT-**

#### **UNIT – 1 (10 Hours)**

Health and safety, Plastics in the society, Plastics in the environment, Plastic waste management, Plastic waste in the marine and terrestrial environment, Plastic material degradation, regulations for hazardous chemicals in articles/plastic products, coated articles. Separation techniques of plastic wastes (density, float sink and froth floatation methods, optical, spectroscopic, sorting by melting temperature etc.).

#### **UNIT – 2 (10 Hours)**

Thermoplastic waste management: 4 R's approach (reduce, reuse, recycle (mechanical and chemical), recover), recycling classification- - primary - secondary - tertiary - quaternary recycling with examples.

#### **UNIT – 3 (10 Hours)**

Disposal processes and Various waste treatment methods – controlled tipping, pulverization, composting, Energy from waste – (incinerators- pyrolysis, factors affecting incineration), new developments in thermal disposal of refuse, on-site disposal methods, compacting and baling. Recycling of Polyolefins, PVC, PET, Polystyrene, Polyamides (Nylon-6 and Nylon-6,6). Recycling of Thermosets –reclaiming of rubber –pyrolysis, depolymerization of scrap rubber, tyre retreading, uses of recycled rubber.

#### **PRACTICAL COMPONENT (60 Hours)**

- Primary recycling of plastic waste collected from the environment.
- Secondary recycling of MSW by incorporating and blending the recyclable waste with virgin polymers.
- To study composting of natural/biopolymers.
- Separation of polymer mixture by sink flotation technique.
- Separation of polymer mixture by selective dissolution technique.

- Recovery of BHET from PET by chemical recycling process
- Recovery of Adipic Acid from Nylon 66 by chemical recycling technique
- To study the effect of vulcanized rubber at varying ratio (in powder form) on mechanical properties of rubber vulcanizate
- Preparation of plasticizer from polyester waste.
- Preparation of reclaim from tyre waste.

### ESSENTIAL/RECOMMENDED READINGS

- Chandra, R., & Adab, A. (1994). Rubber & Plastic Waste: Recycling, Reuse and Future Demand. CBD Publishers.
- Scheirs, J., & Long, T. E. (Eds.). (2005). Modern polyesters: chemistry and technology of polyesters and copolyesters. John Wiley & Sons.

### SUGGESTIVE READINGS

- Blow, S. (1998). Handbook of Rubber Technology.
- Brandrup, J., Bittner, M., Michaeli, W., & Menges, G. (1996). Recycling and Recovery of Plastics, Hanser. Gardner, München.
- Goodship, V. (2007). Introduction to plastics recycling. iSmithers Rapra Publishing.
- Brydson J.A., (2016) Plastics Materials, Butterworth Heinemann, 8<sup>th</sup> Edition.
- Ehrenstein G.W., Riedel G., Trawiel P., (2004) Thermal analysis of plastics, Hanser.

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### GENERIC ELECTIVES (GE-4)

#### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/Practice		
BIOMEDICAL APPLICATIONS OF POLYMERS	4	2	0	2	Class 12 <sup>th</sup> with Physics, Chemistry	----