DESCIPILNE SPACIFIC ELECTIVE COURSES (DSE-19)

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		
POLYMER FOAM TECHNOLOGY	**4**	**2**	**0**	**2**	**12Th with PCM/PCB**	**---**

COURSE OBJECTIVES:

The Learning Objectives of this course are as follows:

1. To learn about the raw materials of foams.
2. Understand the fundamentals of polymer foam technology.
3. Learn about different types of polymer foams and their properties.
4. Study foam formation mechanisms and processing techniques.

LEARNING OUTCOMES

The Learning Outcomes of this course are as follows:

After studying this paper, students will be able to

1. Analyse the building blocks of polyurethanes.
2. Justify the applications of polymer foams in various industries.
3. Understand the effect of the chemical composition of polyurethane foam on properties.

SYLLABUS OF DSE-19

THEORY: **(30Hours)**

UNIT 1: INTRODUCTION OF FOAMS **(7Hours)**

Basics and classification of polymer foams. Raw materials, types of foam: Nitrile rubber, Natural rubber latex, Silicone, polyurethane. polystyrene. polyethylene, polypropylene, rebondfoams,etc.

UNIT 2: MANUFACTURING OF FOAM **(8Hours)**

Foam Formation Mechanisms: Nucleation and growth of bubbles. Foam stabilization and destabilization.

Foam Processing Techniques:Batch foaming, Casting, Spray, continuous foaming, Reaction injection molding of foams and extrusion process.

UNIT 3: PROPERTIES **(8Hours)**

Polymer Foam Properties: Density, Mechanical properties (compression strength, tensile strength, compression set, low temperature flexibility). Thermal properties(thermal conductivity, etc.). Acoustic properties (sound absorption, etc.).

UNIT 4: APPLICATIONS (7Hours)

Cushioning and packaging. Insulation and energy efficiency. Automotive and aerospace applications. Medical devices and healthcare applications.

PRACTICALS: (60 Hours)

- Preparation of nitrile rubber foam.
- Preparation of expanded polystyrene foam.
- To determine the thermal insulation of nitrile rubber foam.
- Testing of nitrile rubber foams (density, Compressive strength, porosity)
- Preparation of Flexible/Rigid PU foam by RIM.
- Preparation of Flexible PU foam by Molding.
- Testing of foam for handloom and automobile applications.
- Determination of physio-Mechanical properties of commercial polymeric foams (Impact, compression, Tear etc.)

ESSENTIAL/RECOMMENDED READINGS

1. Mills, N. J. (1993). Handbook of polymeric foams and foam technology: D. Klempner and KC Frisch (eds) Carl Hanser Verlag.
2. Oertel G., (1993), Polyurethane Handbook, Hanser Publishers; 2Rev Ed Edition.
3. D.Klempner, V.Sendijarevic,(2024) Polymeric Foams and Foam Technology, Hanser Publisher.

SUGGESTIVE READINGS

1. Walker, B. M., & Rader, C. P. (Eds.). (1979). Handbook of thermoplastic elastomers (pp. 115-205). New York: Van Nostrand Reinhold.
2. Elastomers, T. (1987). A Comprehensive Review, edited by NR Legge, G. Holden, and HE Schroeder.
3. Brydson J.A., (2016) Plastics Materials, Butterworth Heinemann, 8th Edition.

ASSESSMENT METHODS:

All the examiniations and assement methods shall be in the line with the University of Delhi gidelinceissused from time to time

KEYWORDS:

Compressive strength, Thermal properties, Cushioning, Open cell foam.