SEMESTER-VII

DISCIPLINE SPECIFIC COURSES (DSC-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		
SpecialtyPolymers	4	2	0	2	12^{Th} with PCM	---

COURSE OBJECTIVES:

1. To study basic concepts of speciality polymers including temperature and fire-resistant and high-performance polymers.
2. To learn about applications of speciality polymers

LEARNING OUTCOMES:

After studying this paper, students will be able to

1. Understand the chemistry for preparation, properties and applications of speciality polymers
2. To analyze the properties of specialty polymers for specific applications such as aerospace, telecommunication, biomedical, defense etc.

THEORY: (30 Hours)

UNIT 1: PREPARATION, PROPERTIES AND APPLICATIONS (15 Hours)

Introduction to engineering/speciality polymers, high temperature and fire-resistant polymers, preparation, properties and applications of the following polymers:

- Polycarbonate (PC)
- Poly(ether ether ketone) (PEEK) and poly(ether-ketone) (PEK)
- Sulphur based polymers (Polysulphone and polyphenylenesulfide)
- Aromatic polyamides, polyamide-imide resins (PAI) and polyimide resins
- Polyacetals
- Polyphenylene oxide (PPO)
- Silicones and polyphosphazenes

UNIT 2: RECENT ADVANCES IN SPECIALITY POLYMERS (5 Hours)

High performance polymer blends and composites, dendrimers, self-healing polymers

UNIT 3: LIQUID CRYSTAL POLYMERS (5 Hours)

Introduction, chemistry of liquid crystal polymerization, synthesis, properties, characteristics of liquid crystal polymers Polyimide, polyamide (Kevlar, Nomax etc.) and polyester-amide based.

UNIT 4: THEMOSETTING POLYMERS (5 Hours)

High performance thermosetting resins such as epoxides, polybenzoxazine etc.

PRACTICALS: (60 Hours)

- Synthesis thiokol rubber and tested its thermal stability
- Synthesis of heat resistant polymers and determine their thermal stability.
- Preparation of high-performance composites [(variation in dispersed phase/matrix/coupling agent) like epoxy-kevlar composite]
- Ageing effect of solvents on mechanical properties of polymers.
- Investigation of performance properties of speciality polymers/composites such as thermal stability and fire resistance.
- Determine the acid value of Nylon 6-10
- Characterization of commercially available speciality polymer samples.
- Preparation of polyethylene tetrasulfide and analysis by chemical methods.
- Determine the dielectric properties (dielectric strength and electrical resistance).

REFERENCES:

1. Brydson J.A., (2016) Plastics Materials, Butterworth Heinemann, 8th Edition.
2. Dyson R. W., (1990) Engg. Plastics, Blackie, Chapman and Hall.
3. Mohammad, F., (2013) Specialty Polymers: Materials and Applications, I.K. International Publishing House Pvt. Ltd.
4. Fink, J. K. (2014). High performance polymers, William Andrew.
5. Gupta, R. K. (2023),Specialty Polymers: Fundamentals, Properties, Applications and Advances, Taylor & Francis Ltd.

ADDITIONAL RESOURCES:

1. Seymour R.B., Kirshenbaum G.S., (1986) High Performance Polymers: their origin and development, Springer.
2. James E. Mark University of Cincinnati., Polymer data hand book, oxford university press (2013).
3. J. Scheirs, Modern Fluoropolymers:High performance polymers, Wiley Inter science (1997)

ASSESSMENT METHODS:

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

KEYWORDS:

Polysulfones, Polyaniline, PEEK, Smart hydrogels, Polycarbonate