

- Mascia L., (1974) The Role of Additives in Plastics, Edward Arnold Publishers Ltd., U.K.
- Murphy J., (2001) Additives for Plastics Handbook, Second Edition, Elsevier Advanced Technology, Oxford.
- Gerard J. F., (2001) Fillers and Filled Polymers, Wiley-VCH verlag GmbH

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DISCIPLINE SPECIFIC CORE COURSE – 9:

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 (if any)
		Lecture	Tutorial	Practical / Practice		
POLYMER DEGRADATION (DSC-09-PD)	4	3	0	1	Passed Class XII with Physics, Chemistry and Mathematics	NIL

LEARNING OBJECTIVES

The Learning Objectives of this course are as follows:

- To familiarize with the utility and importance of polymer degradation
- To learn about the conditions and the reactions of degradation of polymers

LEARNING OUTCOMES

The Learning Outcomes of this course are as follows:

After studying this paper, students will be able to

- Explain the factors responsible for degradation
- Understand the handling of various polymers without affecting the properties
- Evaluate degradation of polymers by various methods

SYLLABUS OF DSC-9

THEORY COMPONENT-

UNIT – I (12 Hours)

CONCEPT OF DEGRADATION

Introduction to degradation, classification of degradation based on

- Pattern of degradation:
 - Random degradation
 - Side chain degradation
 - Chain end degradation
- Cause of degradation (mechanism, factors affecting thermal degradation, example)

- i. Thermal degradation
- ii. Oxidative degradation
- iii. Degradation by radiation
- iv. Mechanical degradation
- v. Chemical degradation
- vi. Biological degradation

UNIT – II (21 Hours)

DEGRADATION OF A FEW THERMOPLASTICS

Different types of degradation patterns with mechanism of the polymers:

- Polyolefins (PE and PP)
- PVC
- Polyamides
- PMMA
- Cellulose
- Polyacrylonitrile (PAN)
- Polystyrene (PS)
- PET

UNIT – III (6 Hours)

DEGRADATION OF ELASTOMERS

- i. PU
- ii. Natural rubber
- iii. SBR

UNIT – IV (6 Hours)

QUANTITATIVE AND QUALITATIVE EVALUATION OF DEGRADATION

Degradation studies using DSC, TGA

PRACTICAL COMPONENT- 30 Hours

- To study biodegradation of polymers.
- To study mechanical degradation of polymers and its effect on properties.
- To study thermal degradation of polymers under various conditions.
- To study thermal analysis of a given polymer by DSC/ TGA.
- To study photo-degradation of PVC.
- To evaluate chemical degradation of PET.
- To determine environmental stress cracking resistance of polymers.
- To evaluate chemical degradation of Nylon 66.
- To study epoxidation of Natural Rubber Latex.
- To study the effect of degradation on properties like: Mechanical strength, hardness, solubility, viscosity etc.

ESSENTIAL/RECOMMENDED READINGS

- Pesce W.J., (2007) Encyclopaedia of Polymer Science and Technology, Wiley.
- Turi E.A., (1997) Thermal Characterization of Polymeric Materials, Academic Press.
- Glaser, J. A. (2019). Biological degradation of polymers in the environment (Vol. 1, p. 13). London, UK: IntechOpen.
- Gilbert, M. (2017). Cellulose plastics. In Brydson's Plastics Materials (pp. 617-630). Butterworth-Heinemann.

- Krasowska, K., Heimowska, A., & Rutkowska, M. (2015). Environmental degradability of polyurethanes. Thermoplastic Elastomers—Synthesis and Applications; IntechOpen: London, UK, 75-94.

SUGGESTIVE READINGS

- Hamid S.H., Amin M.B., (1992) Handbook of Polymer Degradation, Marcel Dekker.
- Ehrenstein G.W., Riedel G., Trawiel P., (2004) Thermal analysis of plastics, Hanser.

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DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-1)

Credit distribution, Eligibility and Pre-requisites of the Course

COMMON POOL OF DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) COURSES OFFERED IN ODD SEMESTERS BY THE DEPARTMENTS

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
ADVANCED ANALYTICAL TECHNIQUES (DSE-01-AAT)	4	2	0	2	Passed 12 th with Science	NIL

LEARNING OBJECTIVES

The Learning Objectives of this course are as follows:

- To acquaint the students with the modern instrumental techniques and their applications in characterization of polymeric materials
- Students will be able to determine a chemical property and identify a chemical substance in a polymer.

LEARNING OUTCOMES

The Learning Outcomes of this course are as follows:

After studying this paper, students will be able to

- Interpret NMR, raman, mass and IR—spectra for characterization of molecular structure of polymeric materials