Course Type	Course Code	Name of Course	L	T	P	Credit
DE	OMED610	Characterisation of Polymers, Elastomers And Composites	3	0	0	3

Course Objectives
At the end of the course, the students will be able to: 1. To study the fundamentals on molecular and mesoscale organization of polymers and composites. 2. The course embodies chemical analysis, identification of polymers, additives, elastomers and composites as per Indian and International standards
Learning Outcomes
On successful completion of this unit students will be able to 1. Perform Spectroscopic techniques including IR, UV, NMR theory, principle and applications to polymers, elastomers, blends, composites and additives will be deliberated. 2. Understand the Thermal analysis techniques including TGA, DSC, DMA, DETA will be elaborated in light of life prediction, degradation kinetics, thermal parameters as well for reverse engineering. 3. Application of X-Ray diffraction techniques WAXS and SAXS will be covered. 4. Identify the Surface characterization e.g. XPS, SIMS and Mass Spectroscopy will be covered. 5. Perform a detailed application of microscopy including optical, SEM, TEM and AFM will be elaborated along with case studies

Unit No.	Topics to be Covered	Lecture Hours	**Video time (Minutes)**	Learning Outcome
1	Introduction of structure-property-process correlation of polymer, elastomer and composites -1	5	148	Understand the fundamentals of polymer correlation
2	Introduction of structure-property-process correlation of polymer, elastomer and composites -2	5	151	Learn the correlation of polymer and composites
3	Identification by chemical techniques with reference to Indian or International standards	5	118	Learning the techniques to evaluate the standards
4	Introduction of UV-Vis and Infrared spectroscopy for polymers, elastomer and composites	5	158	Identification of materials by using various techniques
5	Application of infrared spectroscopy for blends, modification of polymers, compatibilization, coupling, etc.,	5	134	Basic study of blends by IR and adjusting the blends
6	Introduction to Photoacoustic spectroscopy (PAS), Raman spectroscopy, Atomic absorption spectroscopy and Electron spin resonance (ESR) spectroscopy	5	190	Learn the PAS and different types of spectroscopy for the different polymers
7	NMR spectroscopy — principles and fundamentals. Application of NMR in polymer, elastomer and composites	5	215	Understand the principles of NRM application for the polymer, elastomer and composites

8	Thermal analysis techniques and applications in polymer, elastomer, and composites	4	162	Study the techniques of thermal analysis to find out the right polymer
9	XRD, XPS, and XRF- Principles, Fundamentals and Application in Polymer, Elastomer and Composites	5	161	Learn the fundamentals of various polymer applications like XRD,XPS and XRF
10	Introduction to microscopy (Optical, AFM) with special reference to electron microscopy (SEM, FESEM, and HRTEM)	5	191	Microscopy introduction and references incl. all special types
11	Application of microscopy in polymer, elastomer and composites	5	167	Learn the application of microscopy for all polymers
12	Chromatography, DETA, Quantification from Rate Dependent Methods, Reverse Engineering and Recent Advances	6	189	Explore the advancements in terms of materials analysis research
Total		50	1984	

Text Books:

1. Organic Spectroscopy: William Kemp: 3'd Edition: Palgrave USA
2. Spectroscopy of Rubbers and Rubbery materials: Rapra: V. M. Litvinov, P. P. De
3. Characterization Analysis of Polymers: WILEY

Reference Books:

1. Electron Microscopy of Polymers: Springer: GH Michler
2. Transmission Electron Microscopy: A Textbook for Materials Science: David B. Williams, C. Barry Carter, Springer