

COURSE ID SHEET



Course No. 5147 NTUA

Semester: 6 Core X Elective Specialization

Title: **POLYMER ENGINEERING**

Aim: The aim of the course is to introduce students to Polymer Science and Technology and to present the basic principles that govern the production and processing of polymeric materials. Accordingly, the students acquire knowledge about polymerization processes and their quantitative description, being able to correlate polymerization conditions with resulting properties. Critical physicochemical properties of polymers in solid state and in melt are further discussed, with the aim to construct structure-properties relationships. Finally, there is an overview of the basic polymer processing/molding techniques that lead to the production of shaped plastic articles.

Content:

- INTRODUCTION:** Basic concepts - classification of polymers. Molecular weight and distribution. Classification of polymerization reactions and mechanisms.
- POLYMERIZATION PROCESSES:** Chemistry – kinetics of linear step growth polymerization mechanism. Chemistry– kinetics of chain growth polymerization reactions. Copolymerization. Polymerization techniques.
- POLYMER STRUCTURE AND THERMAL TRANSITIONS:** Thermoplastics, thermosets, elastomers. Crystalline and amorphous state. Glass transition and melting points.
- MECHANICAL PROPERTIES:** Introduction to viscoelasticity.
- POLYMER MELTS:** Rheological behavior.
- BASIC POLYMER PROCESSING TECHNIQUES:** Equipment, operational process parameters.

Hours per semester:

LECTURES	39	EXERCISES	-	LABORATORY	-	HOME-WORK	51	TOTAL HOURS: 90
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Student performance/evaluation:

The learning outcomes are assessed through a **written exam (E)** as an open book test, and through an optional literature-based project, where a **written report (R)** is submitted and graded.

The final grade results as follows:

Final Grade = (E) x 0.7 + (R) x 0.3 or

Final Grade = (E)

Prerequisite: E ≥ 5