

Elastomer Engineering

Undergraduate 3 credit course in Polymer Engineering curriculum

Amirkabir University of Technology

Chapter 1: Introduction (Engineering properties of Elastomers, microstructure/properties correlation of Elastomers)

Chapter 2: physics of rubber Elasticity (Introduction to rubber elasticity, theories of rubber elasticity, thermodynamic theory of rubber elasticity, Molecular theory of rubber elasticity, elasticity of rubber network)

Chapter 3: Compounding processes (Objective of compounding and principle of compound design, continuous and batch compounding processes and related theories, milling process and related mixing theories)

Chapter 4: Vulcanization of Elastomers (Introduction to rubber vulcanization, relation between properties and rubber network morphology, curing or vulcanization systems, steps of vulcanization process and role of material processing parameters, kinetic of vulcanization, heat transfer in vulcanization and the role of thermo-physical parameters)

Chapter 5: Mechanic and rheology of filled Elastomers (Introduction to rheology of elastomers, rheological behavior of materials, ideal solid elastics, ideal viscous, viscoelastic fluids, linear viscoelastic models, rheological behavior of elastomers, parameters affecting rheology of elastomeric compounds, mechanical properties of vulcanized rubbers, reinforcing fillers)

Chapter 6: shaping and moulding processes of rubber compounds (Principles of moulding design and optimization, injection moulding, compression and transfer moulding, continuous shaping and curing)

Chapter 7: Reclaiming processes, of cured elastomers (Introduction, mechanical reclaiming, chemical reclaiming, thermal and radiation reclaiming, usage of reclaimed rubber)

Chapter 8: Materials selection and product design (Introduction to rubber additives, principles of materials selection, curing process, mould design, properties/compound correlation)

References:

1. The Science and Technology of Rubber (James E. Mark).
2. Development in Rubber Technology (Whelan).
3. Science and Technology of Rubber (F.R.EIRICH).
4. Rubber processing (James L.White)
5. Vulcanization of Elastomers (G.ALLIGER).
6. Mixing of Rubbers (R.F Grossman).
7. Basic Rubber Compounding and processing (Harry. Long).
8. Heat Transfer and Vulcanization of Rubbers (D.A.HILLS).
9. Rubber Technology Handbook: (Werner Hofmann)
10. Rubber processing and production organization (Philip KFreakly)
11. Rubber processing: (Peter S.Johnson)
12. Rubber compounding: (Brendan Rodgers)
13. Polymer physics: (Ulf W. Gedde)