



Course Syllabus

Department/Faculty School of Engineering
Graduate Program Materials Engineering and Nanotechnology
Degree <input checked="" type="checkbox"/> Academic Master's <input checked="" type="checkbox"/> Doctorate (PhD) <input type="checkbox"/> Professional Master's
Course Name Macromolecular Science
Professor(s)
Office hours 48
Course Overview This course aims at understanding the concepts of the polymeric materials. All the science involved since the conception of these materials will be explored, as well as their structure, morphology, characterization and processing techniques. This course has as main objective to provide the necessary information for students to understand the polymers behavior in their different states and then associate this behavior with their applications, from traditional technologies to the world of nanotechnology.
Topics outline <ol style="list-style-type: none">1. Introduction to Polymer Science2. Chain Structure and Configuration3. Dilute Solution Thermodynamics, Molecular Weights, and Sizes4. Concentrated Solutions, Phase Separation Behavior, and Diffusion5. The Amorphous State6. The Crystalline State7. Polymers in the Liquid Crystalline State8. Glass–Rubber Transition Behavior9. Cross-linked Polymers and Rubber Elasticity10. Polymer Viscoelasticity and Rheology11. Mechanical Behavior of Polymers12. Polymer Surfaces and Interfaces13. Polymer Processing.



Letter Grade Assignment

Grade A (Excellent) - Grade points between 9 and 10

Grade B (Good) - Grade points between 8 and 8.9

Grade C (Satisfactory) - Grade points between 7 and 7.9

Grade D (Unsatisfactory) - Grade points between 0 and 6.9

Texts, Materials, and supplies

Basic

RUDIN, A. CHOI, P. **Ciência e Engenharia de Polímeros**. 3 ed., RJ, Elsevier, 2015.

SPERLING L. H. **Introduction to Physical Polymer Science**. Fourth edition, John Wiley & Sons, 2006.

CANEVAROLO, S. V. **Ciências dos Polímeros**. 2a ed., Artliber, 2010.

URDL, K.; KANDELBAUER, A.; KERN, W. **Self-healing of densely crosslinked thermoset polymers—a critical review**. *Prog Org Coatings* 104:232–249. (2017)
<https://doi.org/10.1016/j.porgcoat.2016.11.010>

ALI, U.; KARIM, M. Ali U, Karim KJBA, Buang NA **A Review of the Properties and Applications of Poly (Methyl Methacrylate) (PMMA)**. *Polym Rev* 55:678–705. (2015)
<https://doi.org/10.1080/15583724.2015.1031377>

KIM, B.J.; MENG, E. **Review of polymer MEMS micromachining**. *Journal of Micromechanics Microengineering* 26:. (2015). <https://doi.org/10.1088/0960-1317/26/1/013001>

LEWIS, C.L.; DELL, E.M. **A review of shape memory polymers bearing reversible binding groups**. *Journal Polym Sci Part B Polym Phys* 54:1340–1364. (2016). <https://doi.org/10.1002/polb.23994>

Complementary:

BRETAS R. E. S.; D'AVILA M. A. **Reologia de Polímeros Fundidos**. 2ª ed., Editora da Universidade Federal de São Carlos, 2005.

CALLISTER W. D. JR. **Ciência e Engenharia de Materiais - Uma Introdução**. 7 ed. LTC, 2008.

CARRAHER, C. H. **Polymer chemistry**. 6rd ed. Marcel Dekker, 2003.

ACKCEL RUD L. **Fundamentos da Ciência dos Polímeros**. Manole, 2006.

BILLMEYER, F.W JR. **Textbook of Polymer Science**. 3rd edition, John Wiley and Sons, 1984.