Course Syllabus

Department/Faculty
School of Engineering

Graduate Program
Materials Engineering and Nanotechnology

Degree
☒ Academic Master's ☒ Doctorate (PhD) ☐ Professional Master's

Course Name
Rheology of Complex Fluids

Professor(s)

Office hours
48

Course Overview
This discipline is aimed to understand the flow and deformation of complex fluids, such as polymers, electro- and magneto-rheological suspensions, nanocomposites, among other relevant materials in the field of nanotechnology. All the science involved will be explored, from its nano / microstructure of complex fluids to its influence on macroscopic rheological properties, under shear and extensional flows. This discipline has the main objective to provide the necessary information for students to understand the rheological behavior of different materials and to associate this behavior with their applications, from traditional technologies to the world of nanotechnology.

Topics outline

1. Introduction to Rheology. 2. General concepts of Rheology and Mechanics of Newtonian Liquids.3 Standard flows and material functions. 4.The role of Rheology as a structural characterization tool. 5.Viscoelasticity and Mechanics of Non-Newtonian Liquids, including the application of models, both phenomenological and molecular, to predict rheological behavior and extract parameters from the model of real data sets. 6. Experimental methods in Rheology with quantitative descriptions of associated flows and data analysis. 7. The relevance of the rheological behavior of different systems for practical processing schemes. 8. Rheology vs Nanotechnology. 9.Rheology applied to nanocomposites. 10.Rheology applied to nanofluids.

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

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Tel. (11) 2114-8143 ● **www.mackenzie.br** ● **prpg.cgpos@mackenzie.br**

Texts, Materials, and supplies

MACOSKO, C. W.. **Rheology Principles: Measurement and Aplications**. Wiley VCH, 1994.

MEWIS, J.; WAGNER N. J.. **Colloidal Suspension Rheology**. New York, Cambridge University Press, 2012.

SABU,T.; SARATHCHANDRAN, C.; CHANDRAN,N. **Rheology of Polymer Blends and Nanocomposites: Theory, Modelling and Applications.** Elsevier, 2020.

VALLES,C.**Chapter 4, Rheology of Graphene Oxide Dispersions:** , Book Editor: Ayrat M. Dimiev

Siegfried Eigler. **Graphene Oxide: Fundamentals and Applications**. John Wiley & Sons, Ltd., 2017.

THOMAS, S.; et al. **Rheology and Processing of Polymer Nanocomposites**. Wiley, 2016.

LARSON, R., G.. **The Structure and Rheology of Complex Fluids**. Oxford University Press, New York, 1999.

MORRISON, F.A.. **Understanding Rheology**. Oxford: Oxford University Press, 2001

SCHRAMM, G.; **Reologia e Reometria: Fundamentos Teóricos e Práticos**. São Paulo, Artliber, 2006.

BRETAS, R. E. S.; D'ÁVILA, M. A.. **Reologia de Polímeros Fundidos**. São Carlos, EDUFSCAR, 2005.

MALKIN, A. Y.. **Rheology Fundamentals**. ChemTec Publishing, 1994

RUDOLPH,N.; OSSWALD,T. **Polymer Rheology: Fundamentals and Applications.** Elsevier, 2014.