TRANSPORT PHENOMENA OF NON-NEWTONIAN FLUIDS

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TYPE OF COURSE : Rerun | Elective | UG/PG
COURSE DURATION : 12 weeks (26-Jul' 21 - 15-Oct' 21)
EXAM DATE : 24 Oct 2021

PRE-REQUISITES : Fluid Mechanics, Heat Transfer, Mass Transfer
INTENDED AUDIENCE : Chemical Engineering, Biotechnology, Food Engineering, Mechanical Engineering

COURSE OUTLINE:
Non-Newtonian fluids are often encountered in our daily life as well as in many industries. Some of the daily-life applications include personal care products such as cosmetics, gels, pastes; food stuffs such as sandwich spreads, ketchup, chocolate, soups, etc. Some of the industrial applications include processing of many polymers, paints and detergents, degassing of polymeric melts and glasses, use of non-Newtonian polymers in enhanced oil recovery, non-Newtonian fluidized beds, wastewater treatment, production of polymeric alloys and ceramics via liquid routes, pharmaceutical products wherein the polymer thickening agents are used to enhance their stability for extended shelf-life, pulp and paper industries, etc. Because of aforementioned overwhelming applications, it is required for both undergraduate and postgraduate students to acquire enough academic experience related to the momentum, heat and mass transfer phenomena associated with non-Newtonian fluids. Thus, in this course, details of types and mathematical models of non-Newtonian fluids, and their momentum, heat and mass transport phenomena are discussed along with the corresponding boundary layer flows. Problems would be discussed on the cases of engineering applications where combined momentum and heat transfer, combined momentum and mass transfer, combined mass and heat transfer, combined heat and mass transport along with homogenous and/or heterogeneous reactions are involved simultaneously.

ABOUT INSTRUCTOR:
Dr Nanda Kishore completed PhD from Indian Institute of Technology (IIT) Kanpur in 2008 and presently is an Associate Professor in the Department of Chemical Engineering of IIT Guwahati, India, since October, 2018. He has been working in the area of “Transport Phenomena of Bubbles/Drops/Particles in Non-Newtonian Fluids” for last 15 years. He has published over 70 research articles in various international level reputed journals and published 30 papers in national/international conference proceedings and published 06 book chapters. He was a visiting researcher of Department of Chemical and Processing Engineering, University of Surrey, Guildford, United Kingdom from June 2016 to July 2016. He received Young Scientist Research Award in 2016 from DAE-BRNS; IEI Young Engineers Award for the year 2015-2016; Young Scientist Research Grant Award from Science and Engineering Research Board of Department of Science and Technology, Government of India, 2013.

COURSE PLAN:
Week 1 : Introduction to Non-Newtonian Fluids
Week 2 : Rheology Measuring Instruments
Week 3 : Equations of Change
Week 4 : Momentum Transfer of Non-Newtonian Fluids
Week 5 : Momentum Transfer of Non-Newtonian Fluids
Week 6 : Flow of Non-Newtonian Fluids though Porous Media
Week 7 : Heat Transfer Phenomena of Non-Newtonian Fluids
Week 8 : Heat Transfer Phenomena of Non-Newtonian Fluids
Week 9 : Mass Transfer Phenomena of Non-Newtonian Fluids
Week 10 : Simultaneous Heat and Mass Transfer with Chemical Reactions
Week 11 : Mass Transfer Combined with Heat Transfer
Week 12 : Boundary Layer Flows of Non-Newtonian Fluids