FLOW THROUGH POROUS MEDIA

PROF. SOMENATH GANGULY
Department of Chemical Engineering
IIT Kharagpur

TYPE OF COURSE       : Rerun I Core_Elective I UG/PG
COURSE DURATION      : 12 weeks (26 Jul'21 - 15 Oct'21)
EXAM DATE            : 23 Oct 2021

INTENDED AUDIENCE : Any engineering students/Faculty

PREREQUISITES : Background in Fluid Mechanics or equivalent is preferred

INDUSTRY SUPPORT : Chemical Process Industries, Oil & Gas Companies, Environmental Consultants

COURSE OUTLINE :
A general overview of porous media flow, and introduction to various theoretical tools to characterize and predict the flow is provided in this course. The course is meant for undergraduate students, pursuing degrees in various engineering disciplines, listed above. The course will serve as a refresher course for PG students, who are engaged in research related to porous media flow.

ABOUT INSTRUCTOR :
Prof. Somenath Ganguly teaches at IIT Kharagpur and supervises a research laboratory on Microstructured Porous Media. He performed research work in the area resulting in several solo-author publications in Transport in Porous Media (Springer), Journal of Porous Media, Chemical Engineering Research and Design. Also, he stays abreast with new knowledge in this field by regularly reviewing manuscripts.

COURSE PLAN :
Week 1: Introduction, Permeability, Porosity, Various forms of characterizations
Week 2: Darcy’s Law, Mass Continuity in Cartesian and Cylindrical Coordinates, Pressure Equations
Week 3: Reynold’s Number for Porous media, Kozeny Carman, and Ergun Equation
Week 4: Transport mechanisms: Bulk and Surface Diffusion, Knudsen Transport, Klinkenberg effect, slip flow
Week 5: Immiscible displacement, two phase mass continuity, capillary pressure
Week 6: Conceptual models of relative permeability and saturation
Week 7: Progression of saturation front in two phase flow, Buckley Leverett theory
Week 8: Miscible displacement, Diffusion in porous media, Tracer Test
Week 9: Introduction to Taylor Aris Dispersion, Dispersion Regimes
Week 10: Migration and interception of fine particles
Week 11: Introduction to flow through deformable porous media
Week 12: Applications, Summary