FLOW THROUGH POROUS MEDIA

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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 Consulatants

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 sole-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