

FLUID MECHANICS

Importance

Mining frequently involves handling of large quantity of water throughout. Mining also affects the local water and air environment. Therefore it is necessary to understand the basic characteristics of fluid and the complexity involved in dealing with them while mining. This course aims at exposing the students, the basic principles of fluid flow, interaction between particles and fluids and the pumps as well as pipe lines to deal with the fluids.

Module-I

[8 Hours]

Scope of fluid mechanics in mining, physical properties of fluid and the influencing parameters (temperature and pressure) on fluid properties, classification of fluids, Bernoulli's equation and its application, numerical problems.

Module-II

[12 Hours]

Fluid kinematics: Fluid flow characteristics in general, concept of Reynold's number, Froude's number, Archimedes number, Stokes number.

Conservation of mass and momentum balances, continuity equation and Navier-Stokes equation. Application of mass and momentum balance equations.

Flow through open channel and through pipe lines- rate of friction factor, temperature and viscosity of fluids. Energy losses in pipes, total head calculations.

Newtonian and Non-Newtonian fluids and basic differences between their characteristics, power law models, boundary layer flows.

Module-III

[10 Hours]

Movements of solids in fluids- Stokes law, Newton's law, transient flow models, effect of particle shape (concepts of sphericity), hindered setting models (Richardson-Zaki, Levenspiel model).

Slurry transport through pipe lines and open channel hydraulics, pumps-various types, characteristics and selection criterion with special emphasis on centrifugal pumps and dredge pumps.

Module-IV

[6 Hours]

Pump and pipeline designs-short and long distance pipe lines, concept of critical velocity. (Case studies and basic calculations)