Course No.	CE205006
Course Title	Free Surface Flow
Credits	L T P C 3 1 0 4
Prerequisites	--

Course contents:

Introduction
Free surface flow overview, Classifications of flows, Types of channels, Pressure and velocity distributions. One dimensional method of flow analysis, continuity, energy and momentum equations.

Specific Energy-Depth Relationships
Specific Energy, Critical depth and its calculation for various channels, Section factor and first hydraulic exponent, Computations of specific energy, Transitions-obstruction and choking.

Uniform Flow
Resistance formulae for free surface flows, Velocity and shear stress distribution, Manning's roughness coefficient, Equivalent roughness, Computation of uniform flow, Standard lined channel, Hydraulically efficient channel sections, Compound channels.

Gradually Varied Flow-Theory and Computations
Differential equation of GVF, Classifications of flow profiles and features of flow profiles, Control sections, Analysis of GVF profiles. Computation of GVF by direct-step and standard-step method.

Rapidly Varied Flow-Hydraulic Jump
Introduction, Momentum equation for hydraulic jump in rectangular channel, Classification of jumps, characteristics of the jump, hydraulic jumps in non-rectangular channels, Use of the Jump as energy dissipator.

Unsteady Flows
Governing equations for gradually varied unsteady flows, Numerical methods to compute unsteady flows, Channel routing by Muskingum Method, Surge in channel: Positive and Negative, Dam break flow problem.

Supercritical flow transitions
Introduction, Response to disturbances, gradually changing boundary, Corner flow, Wave interactions and reflections, Supercritical contractions and expansions.

Mobile bed hydraulics
Introduction, Initiation of sediment particle movement, Formation of bed-forms, Sediment load: Bed, Suspended, Wash and Total load, Design of stable channel (clear water flow), Scouring.

References Books

1. Subramanya, K. *Flow in open channels.* Tata-McGraw-Hill Publishers.
2. Das, M. M. *Open Channel Flow.* PHI Publishers.
3. Srivastava, R. *Flow through open channels*. Oxford Press Publications.
4. Chaudhary, M. H. *Open-channel flow.* Springer Publications.