Year & Sem	Course Code: CE4605	Course Name: Advanced Hydraulics	No. of Credits: 4	L	T&PS	P
				2	2	0

Unit I : Open Channel Flow:

Kinds of open channel flow, channel geometry, types and regimes of flow, Velocity distribution in open channel, wide open channel, specific energy, critical flow and its computation, Energy in non-prismatic channel, momentum in open channel flow, specific force.

Unit II :Uniform Flow:

Qualification of uniform flow, velocity measurement, Manning's and Chezy's formula, determination of roughness coefficients**,** Determination of normal depth and velocity, most economical sections, non-erodible channels**,** Flow in a channel section with composite roughness, flow in close conduit with open channel flow.

Unit III : Varied Flow:

Dynamic equations of gradually varied flow, assumptions and characteristics of flow profiles, classification of flow profile, draw down and back water curves, profile determination, graphical integration, direct step and standard step method, numerical methods, flow through transitions, dynamic equation of spatially varied flow, Analysis of spatially varied flow profile, computation of spatially varied flow using numerical integration.

Unit IV : Hydraulic Jumps:

Hydraulic jump, types of jump, basic characteristics of jump, length and location of jump, jump as energy dissipation, control of jump, surges, surge channel transitions.

Unit V: Flow Through Non-Prismatic Channel Section:

Sudden transition, sub-critical flow through sudden transition, flow through culverts, flow through bridge piers, obstructions, channel junction.

Unit VI : Turbines:

Application of momentum principle, impact of jets on plane and curved plates, turbines, classification, radial flow turbines, Axial flow turbines, impulse and reaction turbines, draft tube and cavitations, performance of turbines, centrifugal pump, minimum speed to start the pump, Multistage pumps, jet and submersible pumps, positive displacement pumps, reciprocating pump, negative slip, flow separation conditions

Text/Reference Books:

1. V.T. Chow: "Open-channel hydraulics." McGraw Hill Publications (1959,1973)
2. Rajesh Srivastava: "Flow through open channels". Oxford University Press (2008)
3. K. Subramanya: "Flow in open channels". Tata McGraw Hill (1997)
4. H. Chaudhury: "Open channel flow". Second Edition. Springer (2008)

Video Reference links:

Title	Expert Name	Affliation	Web link
Advanced Hydraulics	Dr. Suresh A Kartha	**IIT Guwahathi**	**http://nptel.ac.in/courses/105103021/**

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Video Lectures (Web Links):

1. **http://nptel.ac.in/courses/105103021/**