



RIVER ENGINEERING

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INTENDED AUDIENCE : Undergraduate Students in Different Engineering Colleges

COURSE OUTLINE :

In the last few decades, water demand in the globe has increased in many folds. Rivers, one of the major source of water demand for domestic, agricultural and industrial uses, are often not utilised properly for long term sustainability. Therefore, it is a challenging task for engineers for understanding water, sediment and energy transport processes in rivers in both spatial and temporal scales. This course will address how to understand and model hydro-fluvial processes and designing of advanced river intervention structures.

ABOUT INSTRUCTOR :

Prof. Subashisa Dutta, having more than 15 years experience of teaching in IIT Guwahati for both undergraduate and postgraduate students. The Fluid Mechanics course in undergraduate level was instructed five times by the Subject Matter Expert. Besides this, he developed a NPTEL web course on Fluid Mechanics for undergraduate students. In the research and consultancies work of mathematical modelling of different rivers like Brahmaputra, he has been exposed to real life challenging works. In this course, some of the real life problems in Indian rivers will be discussed..

COURSE PLAN :

Week 1: PHYSICAL PROPERTIES AND EQUATIONS

- o Dimensions and units
- o Properties of water and sediment
- o River flow kinematics
- o Conservation of mass
- o Equations of motion
- o Hydraulic and energy grade lines

Week 2: STEADY FLOW IN RIVERS

- o Steady river flow
- o Steady-nonuniform river flow
- o Sediment transport in rivers

Week 3: UNSTEADY FLOW IN RIVERS

- o River continuity equation
- o River momentum equations
- o River flood waves
- o Loop-rating curves
- o River flood routing
- o River flow and sediment-duration curves

Week 4: RIVER EQUILIBRIUM

- o Particle stability
- o Channel stability
- o Regime relationships
- o Equilibrium in river bends
- o Downstream hydraulic geometry
- o Bars in alluvial rivers
- o River meandering
- o Lateral river migration

Week 5: RIVER DYNAMICS

- o River dynamics
- o Riverbed degradation
- o Riverbed aggradation
- o River confluences and branches
- o River databases

Week 6: RIVER STABILIZATION AND RIVER TRAINING WORK

- o Riverbank stability
- o Riverbank riprap revetment
- o Riverbank protection
- o River flow-control structures
- o River training along braided rivers.

Week 7: RIVER ENGINEERING

- o River flood control
- o River closure
- o Canal headworks
- o Bridge scour
- o Navigation waterways

Week 8: RIVER MODELLING

- o Rigid-bed model
- o Mobile-bed river models
- o Finite-difference approximations
- o One-dimensional river models
- o Multidimensional river models