IT-778 : Proforma for course plan

- Course Name: **Advanced Fluid dynamics and its applications in biological systems**
- Course Code: IT-778
- Credit: 3 Credits
- Course offered to: Optional

- Course description: This course will fulfill the need of hydrodynamics as well as advance mathematics for the solution of real world problems in biological systems. The aim of this course is enhance the knowledge and understanding of the students for developing new mathematical real world problems and their solutions in biological problems. The whole of the course will be embodied by different topic of mathematics which will develop student's conceptual knowledge along with the applications. The expected outcome of this course is to enhance the knowledge and understanding of mathematics and help out in their research work.

- Pre-requisite (Mandatory): Student should be able to understand mathematics at the +2 level.

- Pre-requisite (Desirable): Nil
- Course Outcome (CO):

  Students should be able to understand:

  1 The concept of hydrostatics.
  2 Methods to solve the fluid motion equations.
  3 Applications of flow in different planes of different geometries.
  4 Significance of non-dimensional parameters and their significance.
  5 Solution of differential equations for different physical systems.

- Tentative teaching plan:

Week number	**Lecture topic**	**CO met**
1-2	Viscosity, relationship between stress and strain-rate fo Newtonian fluids, incompressible and compressible flows, differences between laminar and turbulent flows. Hydrostatics: Buoyancy, manometry, forces on submerged bodies.	COI
3-5	Eulerian and Lagrangian description of fluids motion, concept of local and convective accelerations, steady and unsteady flows.	CO2
6-8	Bernoulli's equation - assumptions and applications, potential function, Elementary plane flows - uniform flow, source, sink and doublet and their superposition for potential flow past simple geometries.	CO3
9-11	Concept of geometric, kinematic and dynamic similarity, some common non-dimensional parameters and their physica significance: Reynolds number, Froude number and Mach number.	C04

12-14	Differential equations of mass and momentum for incompressible flows: inviscid - Euler equation and viscous flows - Navier-Stokes equations, concept of fluid rotation, vorticity, stream function, Exact solutions of Navier-Stokes equation for Couette Flow and Poiseuille flow.	CO5

1. Fluid Mechanics L D Landau, E. M. Lifshitz -
2. A History and Philosophy of Fluid Mechanics— by G. A. Tokaty
3. Engineering Fluid Mechanics— by H. Yamaguchi
4. Advanced Fluid Mechanics: by William Graebel
5. Elementary Fluid Mechanics by Tsutomu Kambe
6. Cardiovascular Fluid Mechanics by Gianni Pedrizzetti, Karl Perktold
7. Recent Advances in Fluid Mechanics: P.L. Sachdev, M Vcnkatachalappa -