National University of Sciences and Technology

Course Description

Course Title	Course Code	Credit Hours
Computational Biofluidics	ME-828	3 – 0

Textbook:

- "Introduction to Fluid Mechanics" by Robert W. Fox, Alan T. McDonald, and Philip J. Pritchard

Reference Books:

- "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale
- "Computational Fluid Dynamics: Principles and Applications" by Jiri Blazek
- "An Introduction to Computational Fluid Dynamics: The Finite Volume Method" by H.K. Versteeg and W. Malalasekera

Course Objectives:

- To demonstrate and understand the basic principles of fluid mechanics and their application in biological systems

Course Outline:

- Introduction to fluid mechanics
- Definition of fluids and basic properties
- Kinematics of fluid flow
- Continuity equation and Navier-Stokes equations
- Boundary conditions and the no-slip condition
- Numerical methods for biofluidics
- Finite difference method
- Finite volume method
- Finite element method
- Discretization of the Navier-Stokes equations
- Software tools for biofluidic simulations
- ANSYS Fluent
- OpenFOAM
- COMSOL Multiphysics
- Visualization of computational results
- Streamlines, pathlines, and streaklines
- Contour plots and vector plots
- Volume rendering
- Applications of biofluidics
- Blood flow in arteries and veins
- Air flow in lungs and airways

ASSESSMENTS

Description	Percentage Weightage (%)
Assignments	05-10%
Quizzes	10-15%
Mid Semester Exams	30-40%
End Semester Exam	40-50%