

Biofluid Mechanics

Course Text Book:

Biofluid Mechanics, by: J. N. Mazumdar, World Scientific Pub. Co., NJ, 1992.

Course Reference Books:

Biofluid Mechanics, The human circulation (*Chandran & Yoganathan & Rittgers-2007*)

Applied Biofluid Mechanics (*L. Waite and J. Fine-2007*)

Biofluid Dynamics, Principles and selected applications (*C. Kleinstreuer-2006*)

Cardiopulmonary Anatomy & Physiology (*T.D. Jardins-2002*)

The Physics of Coronary Blood Flow (*M. Zamir-2005*)

Course Prerequisite: Fluid Mechanics II

Course Outline:

1. Introduction

Introduction to biological flows

Introduction to heart physiology

Physiology of circulatory flow in human body

2. Fluid Mechanics in Cardiovascular system

Steady flows in a pipe; analytical solutions

Pulsatile flow

Wave propagation and Mones-Korteweg expression

Modeling of blood vessels

Peristaltic motion of blood flows

Fluid mechanics of arterial bifurcation and curved arteries

Solid mechanics

Non-Newtonian fluids

Blood rheology and flow properties of blood

Flow of non-Newtonian fluids in elastic tubes

3. Blood flow modeling in cardiovascular system

Electric analogy of blood flow in an artery

Electric analogy of blood flow in cardiovascular system

One dimensional modeling of cardiovascular system
Multi-scale modeling of cardiovascular system

4. Modeling of respiratory system

Introduction to human lung physiology
Basics of gas distribution and exchange in the human lung
Basics of particle distribution and deposition in the human lung
Introduction to mathematical modeling of the human lung

5. Mass transport in blood flow

Introduction to mass transfer mechanisms
Mass transfer through the membranes
Compartment modeling of mass transport in cardiovascular system

