

## **BMED/ME 4757 Biofluid Mechanics**

**Credit:** 3-0-3

**Prerequisite(s):** AE 2020 or BMED 3300 or ME 3340

### **Catalog Description**

Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application.

### **Text**

Chandran, KB, Yoganathan AP, and Rittgers S. "Biofluid Mechanics: The Human Circulation", *CRC 1<sup>st</sup> Edition* (November 15, 2006), ISBN: 084937328X

### **Objectives**

To introduce undergraduate students to basic biofluid mechanic studies and current clinical research problems with emphasis on the cardiovascular system.

### **Outcomes**

Specifically at the end of the course students will develop a foundation in:

1. Fluid and solid mechanics that are pertinent to blood flow in heart and vessels. (Program Outcome 1)
2. Cardiovascular physiology. (Program Outcome 1)
3. Fluid mechanical analysis of the human circulation, primarily applied to blood flow at the arterial level. (Program Outcome 1 and 2)
4. Fluid mechanical analysis of vascular implants (e.g. prosthetic valves) and measurements in the cardiovascular system. (Program Outcome 1 and 2)
5. Velocity measurement techniques relevant to blood flow (e.g. MRI, Ultrasound Doppler, etc). (Program Outcome 1 and 2)

### **Topical Outline**

1. Introduction/Review of Fluid Dynamics
2. Introduction to Solid Mechanics
3. Review of Cardiovascular Physiology
4. Blood Rheology and Blood Vessel Mechanics
5. Hydrostatics and Steady Flow Models
6. Unsteady Flow and Non-Uniform Geometric Models
7. Native Heart Valve Dynamics
8. Prosthetic Heart Valve Fluid Dynamics
9. Vascular Therapeutic Techniques
10. Fluid Dynamic Measurement Techniques relevant to Blood Flow