

SAMPLE SYLLABUS

Departments of Mechanical Engineering and Bioengineering

ME C213/BIOENG C213 FLUID MECHANICS OF BIOLOGICAL SYSTEMS

Course Number: ME C 213/BioE C214

Course Title: Fluid Mechanics of Biological Systems

Offered: Spring, Fall

Units: 3.0

Course Format: three hours of lecture per week

Prerequisites: ME 106

Grading: Letter, S/U. Problem Sets 50%, Final Project (oral + written report) 50%

Credit Option: None

Estimated number of student hours per week: 9

Course Description:

Fluid mechanical aspects of various physiological systems, the circulatory, respiratory, and renal systems. Motion in large and small blood vessels. Pulsatile and peristaltic flows. Other biofluidmechanical flows: the ear, eye, etc. Instrumentation for fluid measurements in biological systems and for medical diagnosis and applications. Artificial devices for replacement of organs and/or functions e.g. blood oxygenators, kidney dialysis machines, artificial hearts/circulatory assist devices.

Required Text:

Biomechanics: Circulation, by Y. C. Fung, Second Ed., Springer, 1997

Topics:

1. Systemic Circulation
 - A. Rheology of Blood and Blood Vessels
 - B. Arterial Flow
 - C. Microcirculation
 - D. Venous Flow
2. Pulmonary Circulation
3. Pulmonary Ventilation
4. Flow in the Renal System (Ureter)
5. Misc. Fluid Mechanical Biological Systems
 - A. Eye, contact lenses
 - B. Ear, hearing
 - C. Gamete Transport (spermatozoa and ova) and Hydrodynamics of Swimming Organisms

6. Measuring Devices and Techniques (based on fluid mechanical principles or applied to fluid systems)
7. Artificial Devices for Temporary or Permanent Replacement of Human Organs and/or Functions
 - A. Blood oxygenators
 - B. Kidney dialysis machines
 - C. Artificial hearts and circulatory partial assist devices
8. Physiological Flows in Special Situations (space: weightlessness, etc.)

Instructor in charge:

Professor S. A. Berger

Administrative Department:

Mechanical Engineering

Remarks:

Professor Berger introduced this course at least two decades ago, and was the only instructor for most of those years. The course was moved to the Bioeng. Dept., using the same course no., at the same time Professor Berger joined that dept. at .33 FTE. Professor Berger taught it when it was last given, in S'02. An inadvertent error was made in not arranging to have it cross-listed in M.E.. Biomechanics is not a primary interest to the Bioeng. Dept., whereas it still is to M.E.; the latter dept. will thus be a more hospitable home for a serious biomechanics course such as this one. There should be a cross-listing with Bioeng. [Final note: When Professor Berger taught this in S'02 most of the students were from M.E.]