The primary objective of this course is to understand the response of the vasculature to mechanical loads (e.g., hypertension) from the perspective of nonlinear solid mechanics. Basic knowledge of vasculature and related mathematical and mechanical background will be introduced.

Outline:
- Brief review of mathematical and mechanical preliminaries (Chapters 2 and 3)
- Finite elasticity (Chapter 4 – incompressible and compressible isotropic elasticity, membrane hyperelasticity)
- Arterial mechanics (Chapter 7 – especially constitutive framework)
- Vascular adaptation (Chapter 9 – arterial responses to hypertension and altered flow)

Textbook:
Cardiovascular Solid Mechanics, Jay D. Humphrey, Springer-Verlag, NY, 2002

Grading:
- Three Homeworks (30%)
- Paper (40%)
- Final Exam (30%)

Paper topics (use Biomechanics and Modeling in Mechanobiology reference format):

- Arterial Tissue Engineering
- Arterio-Venous Malformations
- Vascular Development
- Marfan’s Syndrome
- Hypertension in Females
- Intravascular Stents
- Primary Pulmonary Hypertension
- Balloon Angioplasty
- Flow-Induced Remodeling
- Vein Grafts
- The Vulnerable Atherosclerotic Plaque
- Ascending Aortic Dissections
- Abdominal Aortic Aneurysms
- Saccular Aneurysms
- Cerebral Vasospasm
- Hypertension and Arterioles