Heart Structure and Cardiac Muscle

• Provides an overview of the anatomy of the heart and the structure of cardiac muscle;
  ~ four chambered heart and double circulation
  ~ heart valves and their functions
  ~ cardiac muscle structure and conduction system
  ~ stroke volume, cardiac output and mean arterial pressure

Anatomy of the Heart
• The heart is located between the lungs in the chest cavity
• The heart has 4 chambers that pump blood through 2 vascular systems at about the same rate but at different pressures: 1) pulmonary (lungs) 2) systemic (body)
• Major structures of the heart:
  ~ right atria receives blood from the vena cava
  ~ right ventricle receives blood from the right atria
  ~ left atria receives blood from the pulmonary veins
  ~ left ventricle receives blood from the left atria
  ~ the heart valves ensure one directional flow
• Blood leaves the right ventricle via the pulmonary artery and the left ventricle via the aorta

Heart Cycle (timings)
• Typical resting heart rate is 60 – 80 bpm
  ~ 1 beat per 0.8 seconds
1) All 4 chambers fill in about 0.4 seconds
2) Atria contract and fill the ventricles in only 0.1 seconds
3) Ventricles contract and empty while the atria refill in 0.3 seconds
• The cycle will only take 0.3 seconds if the heart rate is 200 bpm

Heart Valves
• The valves ensure that blood only flows in one direction:
  ~ valves close as the pressure increases in its chambers
• Valves are attached to the heart wall by chordae tendinae
• Atrioventricular Valves:
  ~ right side : tricuspid valve
  ~ left side : bicispid / mitral valve
# mitral regurgitation occurs when a valve doesn’t close fully
• Ventricular / Semilunar Valves:
  ~ right side : pulmonary valve
  ~ left side : aortic valve
• Heart sounds : lub-dub sound when valves close

Structure of the Heart Wall
• The heart wall consists of:
  Epicardium ~ a connective (areolar) tissue layer beneath an outer mesothelium lining
  Myocardium ~ thick layer of cardiac muscle, blood vessels and nerves
  Endocardium ~ inner lining of simple squamous epithelia and connective (areolar) tissue