



# BROWARD COLLEGE COURSE OUTLINE

**LAST REVIEW:** 2008-2009 **NEXT REVIEW:** 2013-2014 **STATUS:** A  
(i.e. 2003-2004) (i.e. 2008-2009) (A, I, D)

**COURSE TITLE:** Sonography of the Circulatory System

**COMMON COURSE NUMBER:** SON1170

**CREDIT HOURS:** 2

**CONTACT HOUR BREAKDOWN**  
(per 16 week term)

**CLOCK HOURS:**  
(Voc. Course ONLY)

Lecture: 32      Lab:  
Clinic:              Other:

**PREREQUISITE(S):** Program Admission

**COREQUISITE(S):** SON1100

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** (750 character maximum): **An introduction to the hemodynamics of the circulatory systems and the sonographic imaging and Doppler assessment of the cardiac and vascular structures.**

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): Area  
General Education Requirements – Associate in Science Degree (AS), meets Area(s): Area  
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

## UNIT TITLES

1. General
2. Basics of Pediatric and Adult Echocardiography
3. Overview of Cerebrovascular System
4. Overview of Vessels of the Extremities
5. Overview of Abdominoplevic Vasculature

**ASSESSMENT:**

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.  
**Quizzes, Midterm Exam and Final Exam, Competencies in laboratory exercises**

*\*\*\* Complete the following only if course is seeking general education status \*\*\**

**GENERAL EDUCATION Competencies and Skills \*:**

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

<b>1. Read with critical comprehension</b>	
<b>2. Speak and listen effectively</b>	
<b>3. Speak and listen effectively</b>	
<b>4. Think creatively, logically, critically, and reflectively</b> (analyze, synthesize, apply, and evaluate)	
<b>5. Demonstrate and apply literacy in its various forms:</b> (highlight in green ALL that apply) ( 1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental )	
<b>6. Apply problem solving techniques to real-world experiences</b>	
<b>7. Apply methods of scientific inquiry</b>	
<b>8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings</b>	
<b>9. Demonstrate an understanding of and appreciation for human diversities and commonalities</b>	
<b>10. Collaborate with others to achieve common goals.</b>	
<b>11. Research, synthesize and produce original work</b>	
<b>12. Practice ethical behavior</b>	
<b>13. Demonstrate self-direction and self motivation</b>	
<b>14. Assume responsibility for and understand the impact of personal behaviors on self and society</b>	
<b>15. Contribute to the welfare of the community</b>	

*\* General Education Competencies and Skills endorsed by '05-'06 General Education Task Force*

**Common Course Number: SON1170**

## **UNITS**

### **Unit 1** General

#### **General Outcome:**

- 1.0 The student shall:** demonstrate understanding of the characteristics of normal flow in various parts of the circulatory system.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 1.1 Define hemodynamics
- 1.2 Describe the characteristics of steady and pulsatile flow
- 1.3 Explain the following kinds of flow:
  - a. laminar
  - b. parabolic
  - c. disturbed
  - d. turbulent
- 1.4 Describe how stenosis, in general, affects flow
- 1.5 List the constituents of blood
- 1.6 Name the dominant cells in blood
- 1.7 Explain the relationship of density and viscosity to characteristics of flow
- 1.8 Describe the basic components of the cardiac and vascular system
- 1.9 Explain a Doppler waveform as related to pressure and resistance in a vessel
- 1.10 Demonstrate ability to measure pressure gradient
- 1.11 Define the following terms:
  - a. Bernoulli effect
  - b. bruit
  - c. compliance
  - d. Reynolds number
  - c. critical Reynolds number
  - d. eddy current (vortices)
  - e. flow speed
  - f. inertia
  - g. Poise

- h. Poiseuille's law
- i. stenosis
- j. volume flow rate
- k. Doppler effect

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## **UNITS**

### **Unit 2** Basics of Pediatric and Adult echocardiography

#### **General Outcome:**

- 2.0 The student shall:** demonstrate knowledge of the structures and function of the heart and describe the sonographic appearance of the pediatric and adult heart.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 2.1 Describe the function of the heart
- 2.2 Describe the size and position of the heart in the normal child
- 2.3 Describe the position of the heart in the chest of the adult
- 2.4 Name the chambers, great veins and great arteries and valves of the heart
- 2.5 Describe the imaging planes of the heart
- 2.6 Describe the approaches for Doppler evaluation of the valve areas
- 2.7 Describe the flow of blood through the heart of a fully developed fetus including the fetal shunts and their purpose
- 2.8 Describe the flow of blood through the heart of a normal neonate after closure of the fetal shunts
- 2.9 Identify cardiac anatomy in the various imaging planes
- 2.10 Describe cardiac hemodynamics and physiology
- 2.11 Describe the phases of the cardiac cycle and relate them to intracardiac events
- 2.12 Identify normal Doppler flow patterns
- 2.13 Explain the components of an M-mode image of the heart
- 2.14 Define the role of the following physicians in assessing the heart:
  - a. Radiologist
  - b. Cardiologist
  - c. Thoracic surgeon

**2.15** Describe the following diagnostic tests:

- b. Electrocardiogram
- c. Cardiac scan (nuclear medicine)
- d. Electrophysiologic study
- e. Cardiac catheterization
- f. Exercise stress test
- g. Contrast study
- h. Transesophageal echocardiography
- I. Computed Axial Tomography and Magnetic Resonance Imaging

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## **UNITS**

### **Unit 3** Overview of the Cerebrovascular system

#### **General Outcome:**

- 3.0 The student shall:** describe the anatomy, physiology and hemodynamics of the cerebrovascular system and the sonographic imaging and Doppler evaluation of these vessels

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 3.1** Describe the indications for sonographic evaluation of the cerebrovascular structures
- 3.2** Compare sonographic imaging and Doppler techniques with other diagnostic imaging techniques in the assessment of cerebrovascular pathology
- 3.3** Describe the anatomy of the cerebrovascular circulation
  - a. branches of aortic arch
  - b. common carotid artery
  - c. internal and external carotid arteries and their major branches
  - d. vertebral arteries
  - e. circle of Willis
- 3.4** Describe the sonographic appearance of the common, internal and external carotid arteries and jugular vein
- 3.5** Explain the role of duplex sonography in evaluating the cerebrovascular system
- 3.6** Describe transcranial duplex imaging techniques
- 3.7** Identify the common, internal and external carotid arteries and jugular vein on a sonogram
- 3.8** Explain some of the difficulties associated with carotid duplex examination
- 3.9** Define collateral circulation
- 3.10** Explain the hemodynamic importance of the circle of Willis
- 3.11** Describe imaging features that distinguish the internal carotid artery from the external carotid artery
- 3.12** Identify normal Doppler waveforms for the internal and external carotid arteries

- 3.13** Describe the appearance of a Doppler waveform when severe stenosis is present
- 3.14** Name the access windows to the cranium used in transcranial Doppler
- 3.15** Describe the role of color-flow imaging in assessing the cerebrovascular system
- 3.16** Explain the relationship of the colors shown to the transducer position
- 3.17** List two parameters measured on a Doppler spectral waveform that are used in diagnostic criteria
- 3.18** Draw a sample carotid waveform and illustrate where you would measure these parameters

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## **UNITS**

### **Unit 4** Overview of The Vessels of the Extremities

#### **General Outcome:**

- 4.0 The student shall:** describe the anatomy, physiology and hemodynamics of the upper and lower extremities, and to explain the role of sonographic imaging and Doppler in the evaluation of these vessels.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 4.1** Describe the anatomy of the lower extremity arterial system
- 4.2** Explain the hemodynamics of the lower extremity arterial system
- 4.3** Recognize the arteries of the lower extremities on a sonogram
- 4.4** Describe the characteristics of a Doppler waveform of the lower extremity arteries
- 4.5** Explain the term “triphasic” pattern
- 4.6** Explain the role of color-flow Doppler in evaluating the lower extremities
- 4.7** Describe the anatomy of the lower extremity venous system
- 4.8** Explain the hemodynamics of the lower extremity veins
- 4.9** Recognize the veins of the lower extremities on a sonogram
- 4.10** Describe the characteristics of a Doppler waveform of the lower extremity veins
- 4.11** Explain the use of augmentation and compression of the veins in the legs
- 4.12** Describe the anatomy of the upper extremity arterial system
- 4.13** Describe the anatomy of the upper extremity veins
- 4.14** Explain the hemodynamics of the upper extremity vessels
- 4.15** Describe the characteristics of a Doppler waveform of the upper extremity arteries and veins
- 4.16** Describe an A-V graft and relate its purpose(s)

**4.17** Recognize the characteristics of flow in a normal A-V graft

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## **UNITS**

### **Unit 5** Overview of Abdominoplevic Vasculature

#### **General Outcome:**

- 5.0 The student shall:** describe the anatomy, physiology and hemodynamics of the vessels in the abdomen and pelvis, and the role of sonographic imaging and Doppler techniques in the assessment of the vessels.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 5.1 Describe the anatomic composition of vascular structures
- 5.2 Explain the function of the circulatory system
- 5.3 Describe the branches of the aorta
- 5.4 Describe the veins that drain into the IVC
- 5.5 Describe the major arteries in the chest, abdomen and pelvis
- 5.6 Explain the hemodynamics of the Abdominoplevic vasculature
- 5.7 Describe the sonographic appearance of the aorta and its' branches
- 5.8 Describe the sonographic appearance of the IVC and its' tributaries
- 5.9 Explain the anatomy of the portal system
- 5.10 Describe the circulation of the vessels related to the portal system
- 5.11 Recognize Doppler waveform characteristics of the Abdominoplevic vessels - arteries and veins
- 5.12 Explain the difference in mesenteric vessel caliber pre and postprandial
- 5.13 Identify the vessels of the abdomen and pelvis on a sonogram
- 5.14 Describe methods to distinguish arteries from veins with imaging and Doppler
- 5.15 Explain the role of color-flow Doppler techniques in assessing vessels of the abdomen and pelvis
- 5.16 Explain respiratory variations in vessels and relate which vessels exhibit them

- 5.17** Identify high resistance and low resistance flow on a Doppler waveform, and explain which vessels should exhibit each
- 5.18** Explain what is meant by resistive index? Pulsatility index?
- 5.19** Explain what a porta caval shunt is, and when it is used.
- 5.20** Explain the significance of seeing a vessel or vessels in an abnormal position
- 5.21** Compare sonography and Doppler examination efficacy with angiography as a diagnostic method