

# LINCOLN UNIVERSITY



## DI 114 – Vascular Anatomy and Hemodynamics

### Course Syllabus

Fall 2019

**Instructor:** Marina Kay, RDMS (Abd), RVT  
**Lecture Schedule:** Wednesday, 9:00 AM - 11:45 AM  
**Credits:** 3 units (45 hours of lectures)  
**Pre-requisites:** DI 110  
**Level:** Developed (D)  
**Office Hours:** Monday and Wednesday by appointment  
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#### TEXTBOOKS:

1. **Ultrasound Physics and Instrumentation.** Frank Miele.  
5th Edition (2013). Volume II  
ISBN-10: **0988582503**; ISBN-13: **978-0988582507**
2. **Vascular Ultrasound: How, Why and When.** Abigail Thrush, Tim Hartshorne.  
3rd Edition (2009).  
ISBN-10: **0443069182**; ISBN-13: **978-044306918**

Additional recommended textbooks and instructional materials will be given during classes.

#### READING ASSIGNMENTS

**Introduction to Vascular Ultrasonography.** William J. Zwiebel, John S. Pellerito.  
6th Edition (2012). ISBN-10: **143771417X**; ISBN-13: **978-1437714173**

**Last Revision:** December 14th, 2018

**NOTE:** Instructor may change this syllabus and course schedule at any time according to the judgment as to what is best for the class. Any changes will be declared ahead of time in class

#### CATALOG DESCRIPTION

This course provides the knowledge of gross anatomy of the central, peripheral and cerebrovascular systems, principles of the dynamics of blood circulation in the human body, the factors that influence blood flow, and hemodynamic consequences of occlusive disease.

**COURSE OBJECTIVES**

Upon satisfactory completion of this course, students will be able to:

- Demonstrate the basic understanding of the normal physiology and physical principles of the blood circulation
- Describe the anatomy, physiology and normal variations of central and peripheral arterial and venous systems
- Understand the use of color Doppler and pulsed wave Doppler in the process of vascular evaluation
- Be able to perform the basic Doppler waveform analysis
- Describe standard measurements for duplex vascular evaluation
- Recognize abnormalities that can occur in the presence of vascular obstruction
- Differentiate normal from abnormal blood flow patterns
- Know the different diagnostic criteria for peripheral arterial disease
- Apply the diagnostic criteria and link Doppler image information to the manifestations of cerebrovascular disease
- Understand normal venous physiology by the evaluation of Doppler imaging
- Recognize the significance of venous pathophysiology by the use of ultrasound imaging
- Apply the diagnostic criteria to determine the extent of venous insufficiency
- Determine the presence of thrombosis in deep and superficial venous systems

**COURSE LEARNING OUTCOMES<sup>1</sup>**

	<b>Course Learning Outcome</b>	<b>Program Learning Outcomes</b>	<b>Institutional Learning Outcomes</b>	<b>Assessment activities</b>
1	Understand the anatomy, physiology and normal variations of central and peripheral vascular systems.	PLO 1	ILO 1a, ILO 2a, ILO 3a	In-class activities, quizzes, midterm and final exams.
2	Recognize sonographic signs of vascular pathological findings and differential diagnosis.	PLO 1 PLO 3	ILO 1a, ILO 2a, ILO 3a, ILO 4a	Ultrasound case analysis and group discussions, quizzes, course projects presentations and discussions of students' projects.
3	Demonstrate knowledge of diagnostic criteria for duplex evaluation of the vascular system.	PLO 1 PLO 3	ILO 1a, ILO 2a, ILO 3a, ILO 4a	Ultrasound case studies, quizzes, midterm and final exams, course projects presentations and discussions of students' projects.

<sup>1</sup> Detailed description of learning outcomes and information about the assessment procedure are available at the [Center for Teaching and Learning](http://ctl.lincolnuca.edu) website (ctl.lincolnuca.edu).

4	Be able to perform the basic Doppler waveform analysis.	PLO 1 PLO 3	ILO 1a, ILO 2a, ILO 3a, ILO 4a	Ultrasound case studies; course project presentations and discussions of students' projects.
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### INSTRUCTIONAL METHODOLOGY

Instructional methods will include lectures and in-class hands-on learning activities. Classroom activities are collaborative — students may and should help each other. The instructor will be available to help students with all tutorials and other assignments.

The topics will be presented through the following activities:

- Reading assigned textbooks and lecture outlines (handouts);
- Presentation of material (lectures) by the instructor, using the Power Point and visual aids;
- Quizzes based on reading assignments (text and lecture readings);
- Internet resources;
- Final and midterm examinations;
- Group discussions of the relevant topics and ultrasound case analyses;
- Students' in-class projects presentations and discussions.

Assignments and projects require students to actively use resources of the library. A detailed guide to business resources of the library as well as the description of Lincoln University approach to information literacy are available at the [Center for Teaching and Learning](http://ctl.lincolnuca.edu) website (ctl.lincolnuca.edu).

#### Reading Assignments:

Students are expected to be prepared in advance before the class sessions. Being prepared includes the following: having read text materials (e.g., reading textbooks, lecture outlines and handouts) to review and analyze the lecture given during a previous class session; bringing required work materials (e.g., textbook, handouts, writing supplies, etc.) to the session.

These assignments are graded through short quizzes given at the beginning of the following class session.

#### Project:

Each student will choose the topic for the project or will be assigned one by the instructor. The project will be presented at the end of the course.

The presentation should be approximately 10 minutes long and with 5 minutes for a discussion.

The presentation should include ultrasound images, related to the topic of presentation.

The topic and format of the presentation will be discussed in class for more details.

#### Evaluation Criteria for the Project:

- Clinical statement: 2%
- Background information: 2%
- Slide content: 2%
- Slide design: 1%
- Resolution of the problem: 2%
- Oral presentation in class: 1%

Total: 10% of all the course grading elements

**Quizzes:**

- Students will take 10 quizzes throughout the course. These quizzes will address the detailed content and major concepts presented in the lectures, lecture outlines and text readings to evaluate students' work outside of the classroom.
- Every class session will start with a 15 minutes quiz, based on the previous homework assignment.
- A quiz will consist of 10-15 questions, some combination of true/false, multiple choice, and "fill-in" questions.
- Each quiz will be timed, 1 minute for every question to complete.
- The correct answers of the quiz and a relevant topic will be discussed and reviewed.
- No make-up quizzes for missed quizzes will be administered (students will receive no score for missed quizzes).
- The primary purpose of these quizzes is to encourage and reward the students' progress through the course materials.

**Midterm and Final Examinations:**

- The exams will consist of the questions based on the course material, studied through the semester.
- The written examinations (multiple choice and true/false format and will be closed-book exams).
- The Midterm Exam will consist of 75 multiple choice and true/false questions and will cover Lectures 1-5
- The Final Exam will consist of 100 multiple choice and true/false questions, and will cover Lectures 1-8
- A student must take the exam during the scheduled time period.

There will be no make-up for a missed exam, unless you have the instructor's approval obtained prior to the exam date, with the exception of an emergency.

**CLASS PROCEDURES**

- We will work together, as a team: communication, participation and interaction.
- A positive learning environment is a key to success. Nobody should be afraid to ask questions. A lot of questions and comments during the class are encouraged: nothing should remain unclear.
- I believe that the repetition is the mother of knowledge. So, we will be reviewing the previously studied material again and again: weekly written quizzes, quick oral tests, class discussions and case studies. We cannot forget what we have learned. Be prepared to work hard and to learn a lot.

**ATTENDANCE**

- Attendance at all classes is essential for successful completion of this course.
- The topics covered in the lectures are related to each other. You can move forward only if you are familiar with the material of the previous lecture.
- Students are expected to attend and be prepared for all regularly scheduled classes: arriving on time, remaining quiet when others are speaking, and paying attention to whoever has the floor in the classroom.
- Considering possible urgent situations, students may be absent from maximum four class meetings with prior notice to the instructor. Three late arrivals would affect the grade.

- Students are required to behave in accordance with Lincoln University's Student Honor Code and Standards of Conduct, which can be found in the Student Handbook.

### STUDENT RESPONSIBILITIES

- Students are expected to attend class, to participate in individual and group work in a productive manner, perform well on tests, and to complete assignments according to schedule.
- Every student should take personal responsibility for meeting the objectives of the course.
- Students are expected to treat faculty and fellow students with respect.
- Students engaging in disruptive behavior in class will be asked to leave and may be subjected to other penalties if the behavior continues.
- No eating, sleeping or personal grooming is permitted in the classroom.
- ***Drinks are allowed only in closed containers.***
- The cell phones should be turned off.
- A computer can be used in class only to take notes, to access course materials from the course webpage, or to locate information relevant to the class discussion. Do not use your computer to surf the web, check emails, or send/receive messages.

### GRADING

All activities will be graded according to the points as shown below.

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Points	95-100	90-94	87-89	84-86	81-83	78-80	76-77	74-75	72-73	70-71	0-69

The final grade for the course will be given as the total weighted score for all activities according to the percentage shown in the table below.

Activity	Percent
Class Attendance	10%
Project	10%
Quizzes	20%
Midterm Exam	30%
Final Exam	30%
<b>TOTAL</b>	<b>100%</b>

### LECTURES SCHEDULE

Dates	Lectures	Topics	Quiz
21-Aug	Lecture 1	<b>Human Circulatory System. Systemic and Pulmonary Blood Circulation</b>	
28-Aug	Lecture 2	<b>Gross Anatomy of the Central and Peripheral Arterial System</b>	<b>1</b>
4-Sep	Lecture 3 Part I	<b>Physiology and Hemodynamics of the Arterial System. Types of Pressures. Blood Flow Characteristics</b>	<b>2</b>
11-Sep	Lecture 3 Part II	<b>Physical Principles of Fluid Dynamics. Poiseuille's Law, Bernoulli Equation, Reynolds Number</b>	<b>3a</b>

18-Sep	Lecture 4	<b>Arterial Doppler Waveform Analysis. Steady and Pulsatile Flow. Peripheral Resistance. Effects of Stenosis and Exercise on the Arterial Flow</b>	<b>3b</b>
25-Sep	Lecture 5 Part I	<b>Gross Anatomy of the Extracranial and Intracranial Cerebrovascular System</b>	<b>4</b>
2-Oct	Lecture 5 Part II	<b>Physiology and Hemodynamics of the Cerebrovascular System. Spectral and Color Doppler Analysis</b>	<b>5</b>
9-Oct		<b>Midterm Exam (Closed Books)</b>	
16-Oct	Lecture 6 Part I	<b>Anatomy of the Peripheral Venous System</b>	
23-Oct	Lecture 6 Part II	<b>Peripheral Venous System. Muscle Pump Mechanism. Venous Valvular Function</b>	<b>6a</b>
30-Oct	Lecture 7	<b>Hemodynamics of the Peripheral Venous System. Effect of Respiration on Venous Pressure. Spectral and Color Doppler Analysis</b>	<b>6b</b>
6-Nov	Lecture 8 Part I	<b>Abdominal Venous System Anatomy and Hemodynamics. Portal Venous System. Abdominal Venous System B-scan, Spectral and Color Doppler Analysis.</b>	<b>7</b>
13-Nov	Lecture 8 Part II	<b>Abdominal Venous System B-scan, Spectral and Color Doppler Analysis. Presentations of Projects.</b>	<b>8</b>
20-Nov		<b>Final Exam (Closed Books)</b>	
27-Nov		<b>FALL RECESS</b>	
4-Dec		<b>Make Ups</b>	