LINCOLN UNIVERSITY

DI 114 – Vascular Anatomy and Hemodynamics

Course Syllabus

Spring 2019

Instructor:	Marina Kay, RDMS (Abd), RVT
Lecture Schedule:	Thursday, 12:30 pm - 3:15 pm
Credits:	3 units (45 hours of lectures)
Pre-requisites:	DI 110
Level:	Developed (D)
Office Hours:	Monday, Tuesday and Thursday by appointment **E-mail:** kaymarina@yahoo.com **or** mkay@lincolnuca.edu **Telephone:** (925) 642-7701 **Diagnostic Imaging Lab Telephone:** (510) 238-9744

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[1]

	Course Learning Outcome	Program Learning Outcomes	Institutional Learning Outcomes	Assessment activities
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.

[1] Detailed description of learning outcomes and information about the assessment procedure are available at the Center for Teaching and Learning 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.

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 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%
TOTAL	100%

LECTURES SCHEDULE

Dates	Lectures	Topics	Quiz	Related CLO
17-Jan	**Lecture 1**	**Human Circulatory System. Systemic and Pulmonary Blood Circulation**		**CLO 1**
24-Jan	**Lecture 2**	**Gross Anatomy of the Central and Peripheral Arterial System**	**1**	**CLO 1**
31-Jan	**Lecture 3 Part I**	**Physiology and Hemodynamics of the Arterial System. Types of Pressures. Blood Flow Characteristics**	**2**	**CLO 1**

7-Feb	**Lecture 3 Part II**	**Physical Principles of Fluid Dynamics. Poiseuille's Law, Bernoulli Equation, Reynolds Number**	**3a**	**CLO 1**
14-Feb		**HOLIDAY**		
21-Feb	**Lecture 4**	**Arterial Doppler Waveform Analysis. Steady and Pulsatile Flow. Peripheral Resistance. Effects of Stenosis and Exercise on the Arterial Flow**	**3b**	**CLO 1, CLO 2, CLO 3**
28-Feb	**Lecture 5 Part I**	**Gross Anatomy of the Extracranial and Intracranial Cerebrovascular System**	**4**	**CLO 1**
7-Mar	**Lecture 5 Part II**	**Physiology and Hemodynamics of the Cerebrovascular System. Spectral and Color Doppler Analysis**	**5**	**CLO 1, CLO 3, CLO 4**
14-Mar		**SPRING RECESS**		
21-Mar		**Midterm Exam (Closed Books)**		
28-Mar	**Lecture 6 Part I**	**Anatomy of the Peripheral Venous System**		**CLO 1**
2-Apr	**Lecture 6 Part II**	**Peripheral Venous System. Muscle Pump Mechanism. Venous Valvular Function**	**6a**	**CLO 1**
4-Apr	**Lecture 7**	**Hemodynamics of the Peripheral Venous System. Effect of Respiration on Venous Pressure. Spectral and Color Doppler Analysis**	**6b**	**CLO 1, CLO 3, CLO 4**
11-Apr	**Lecture 8 Part I**	**Abdominal Venous System Anatomy and Hemodynamics. Portal Venous System. Abdominal Venous System B-scan, Spectral and Color Doppler Analysis.**	**7**	**CLO 1, CLO 3, CLO 4**
18-Apr	**Lecture 8 Part II**	**Abdominal Venous System B-scan, Spectral and Color Doppler Analysis.**		**CLO 2 CLO 3, CLO 4**
25- Apr		**Presentations of Projects.**	**8**	**CLO 2, CLO 3, CLO 4**
2- May		**Final Exam (Closed Books).**		

APPENDIX A. Program and Institutional Learning Outcomes.

Institutional Learning Outcomes (ILOs)	
Graduates of the BS program of Lincoln University should be able to:	
1a	Develop the habits and skills necessary for processing information based on intellectual commitment and using these skills to guide behavior.
2a	Raise important questions and problems, and formulate them clearly and precisely in oral or written communication.
3a	Act with dignity and follow the principles concerning the quality of life of all people, recognizing an obligation to protect fundamental human rights and to respect the diversity of all cultures.
4a	Focus on individual and organizational benefits; communicate to co-workers and company's leadership in facilitation of collaborative environment; to be honest and transparent with regard to their work, and to be respectful of the work of others.
5a	Display sincerity and integrity in all their actions, which should be based on reason and moral principles; to inspire others by showing mental and spiritual endurance.
6a	Show creativity by thinking of new and better goals, ideas, and solutions to problems; to be resourceful problem solvers.
7a	Define and explain the boundaries, divisions, styles and practices of the field, and define and properly use the principal terms in the field.

Program Level Outcomes (PLOs)	
Students graduating our BS in Diagnostic Imaging program will be able to:	
1	Develop and demonstrate knowledge in principles of UT, medical terminology, physiology, sonography, and echocardiography.
2	Demonstrate ability of accurate patient positioning techniques and use of imaging technology.
3	Adapt imaging procedures based on patient's needs and clinical limitations.
4	Practice effective oral and written communication skills in the clinical setting.

APPENDIX B. Classification of LU Curriculum Courses.

Code	Classification	Description
Courses < 10, and 300A/300B	Review (R)	Review courses are supplemental courses that are not a part of any program.
Courses 10 - 99	Introductory (I)	Introductory undergraduate courses are designed to acquaint students with foundational concepts, ideas, and competences in a specific field of study as well as general education disciplines. General Education courses provide a background in the liberal arts and expose students to the fundamental aspects of human culture. They also help students to develop analytical and communication skills and foundation for advanced work in the major field of study.
Courses 100 - 199	**Developed (D)**	**Developed undergraduate courses build upon the concepts, ideas, and competences introduced in the Introductory level; expanding students' understanding of the specific field of study.**
Courses 200 - 286	Advanced (A)	Advanced courses in undergraduate programs are intended to bring students' comprehensive knowledge of concepts, ideas, and skills in the specific field of study to the highest level within the baccalaureate programs.
Courses 288 - 299	Bachelor Assessment (BA)	Bachelor Assessment courses are structured to provide opportunity to assess students' achievements of set program learning outcomes.
Courses 300 level w/o graduate prerequisites	Mastery 1 (M1)	Mastery 1 courses introduce graduate level concepts and ideas in a specific field of study and provide an opportunity to initiate the development of graduate level competences.
Courses 300 level with graduate prerequisites	Mastery 2 (M2)	Mastery 2 courses build upon students' execution of Mastery 1 learning outcomes and allow for further development of students' mastery of concepts, ideas, and competences in the specific field of study.

Courses 398, 399	Mastery 2 / Assessment (M2A)	Mastery 2/Assessment courses are structured to provide opportunity to assess students' achievements of set program learning outcomes.
Courses 400 level	Mastery 2 / Research (M2R)	Mastery 2/Research courses employ individual research project to deepen students' understanding of the subject developed in lower level courses and to equip students with knowledge and skills required by MS and DBA degree programs.
Courses 500 level	Doctorate Assessment (DA)	Doctoral Assessment courses are doctorate level seminars and research activities fostering the highest level of professional expertise by providing continuous assessment and development of students' ideas and analytical skills in the context of the doctorate program.