



# LINCOLN UNIVERSITY

## DI 125 – Introduction to Echocardiography

### Course Syllabus

Fall 2022

**Instructor:** Dr. Olesya Smolyarchuk

**Lecture Schedule:** Wednesday 9:00 AM – 11:45 AM

**Lab Schedule:** Tuesday 6:30 PM – 9:15 PM - 09/13/2022 – 11/15/2022

**Instructor:** Ms. Doan

**Credits:** 4 units: 3-unit lecture and 1-unit lab  
(75 total hours: 45 hours of lectures and 30 hours of lab)

**Pre-requisites:** *DI 110, DI 115*

**Level:** Developed (D)

**Office Hours:** By appointment Dr. Smolyarchuk  
E-mail: [osmolyarchuk@lincolnucsf.edu](mailto:osmolyarchuk@lincolnucsf.edu)

**Lab Instructor:** Ms. Doan

#### TEXTBOOKS:

1. **ASE's Comprehensive Echocardiography**, 2nd edition, Roberto M Lang, Steven A Goldstein, Itzhak Kronzon, Bijoy K Khandheria, Victor Mor-Avi. 2016 ISBN: **978-0-323-26011-4**
2. **The Echo Manual**, 4th edition, Jae k Oh, Gavan C Kane, James B Seward, A Jamil Tajik, 2019 by Wolters Kluwer ISBN: **978-1-4963-1219-8**
3. **Echocardiography: The Normal Examination and Echocardiographic Measurements**, 3rd edition, Bonita Anderson, 2017 ISBN: **9780992322212**

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

**Last Revision:** 8/9/2022

**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 introductory course focuses on normal heart anatomy, scanning techniques, modes of echocardiographic examination and cardiac hemodynamics. (4 units).

**COURSE OBJECTIVES**

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

- Utilize Two-dimensional echocardiography, identify and assess the normal anatomical structures of the heart and great vessels.
- 2D/M-mode Anatomy – identify basic two-dimensional and M-mode anatomy and the structures contained within each image displayed.
- Spectral and Color Doppler – identify direction and velocity information given in the color and spectral Doppler images/waveforms.
- Cardiac Physiology – explain the electrical and mechanical events within the cardiac cycle.
- Cardiac Hemodynamics – explain normal hemodynamic parameters, including intracardiac pressure and oxygen saturation.
- Basic EKG and Auscultation – describe the normal EKG and commonly encountered abnormal EKG findings. Explain normal and abnormal heart sounds and their relationship to the cardiac cycle.
- Systolic Function – describe basic echocardiographic measurement parameters to assess LV and RV systolic function.
- LA, RA, and RV Function – explain and describe the basic echocardiographic measurement parameters that assess LA, RA and RV normal and abnormal function.
- Normal Examination – describe the ASE recommended views and measurements in the complete normal transthoracic echocardiogram.

**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 and physiology of the cardiovascular system and the cardiac conduction system. | PLO 1                            | ILO 1a,<br>ILO 2a                      | In-class activities          |
| 2 | Complete a systematic survey of the heart with 2-D and M-Mode ultrasound imaging;                     | PLO 2                            | ILO 1a,                                | In-class activities, lab     |

<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).

|   |   |                |                   |  |
|---|---|----------------|-------------------|--|
|   | document and measure all structures in all standard views and expand the protocol as required to document ambiguous findings or suspected pathology.  | PLO 5          |                   | activities, quizzes  |
| 3 | Relate 2-D image anatomy to its correlate M-mode pattern, compare and contrast each method of display.  | PLO 3<br>PLO 5 | ILO 6a,<br>ILO3 a | In-class activities, lab activities, quizzes, midterm, and final exams |
| 4 | Properly judge the quality of acquired data and communicate any limitations. State the normal range measurement values for each principal cardiac structure and physiologic function.   | PLO 1<br>PLO7  | ILO 3a            | In-class activities, quizzes, midterm, and final exams                 |
| 5 | Identify each anatomic region and segment of the heart from any given echocardiographic view; relate it to its usual coronary distribution.<br><br>Identify abnormalities of resting cardiac wall motion and thickening using standard terminology; classify each according to its clinical significance. | PLO 4<br>PLO 5 | ILO 7a,           | In-class activities, lab activities, quizzes, midterm, and final exams |

### INSTRUCTIONAL METHODS

- Lectures and assigned reading material
- Internet resources

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).

### REQUIREMENTS

#### Ultrasound Hands-on Laboratory Training

Practical experience students will gain under the guidance of a lab instructor. Students are expected to arrive at class on time and stay through the end of the ultrasound laboratory class.

## EVALUATION

### Quizzes:

- Students will take 10 quizzes throughout the course. These quizzes will address the material presented in the previous lectures, discussions, and text readings to evaluate students' work inside and outside the classroom.
- 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 & Final Examinations:

- Midterm consists of 30 questions and final examination of 50 questions.
- The written examinations are proctored and will be closed-book exams.
- The Scranton machine will be used in grading multiple-choice tests.
- A student **MUST** take the exam during the scheduled time period.
- A student missing an exam because of an illness or legitimate emergency may take a make-up exam as soon as possible after the student returns from the illness and as determined by the instructor. Absences covering such emergencies as serious illness or similar may be excused by the Dean provided the absence is properly documented.
- If no excuse is received by the Records Office, the student will be considered as having no excuse.

### Ultrasound Hands-on Laboratory Examination:

- Final ultrasound hands-on examination, students have to demonstrate understanding of information presented during lectures and hands-on laboratory training.
- Students have to perform echocardiographic protocols and demonstrate scanning technique and images in B-, Color-Modes, and M-mode.
- Students will schedule the time and date 2-3 weeks ahead of the Ultrasound hands-on laboratory examination.

## ATTENDANCE AND PARTICIPATION

Efficient use of the lab time, demonstration of the development of the scanning skills, effective use of ultrasound machines, and active participation during the class meetings is expected.

Students are encouraged to use open lab time as needed. Minimum **12 lab hours** of the independent scanning throughout the semester should be recorded in a log sheet as a part of each student's hands-on self-study training.

Students are expected to arrive to class on time and stay through the end of the laboratory class. Absence, late arrival, poor use of class time, early leave will result in a lower grade.

Instructor may dismiss a student from the course after missing 3 consecutive class meetings.

## 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 | 94-100 | 90-93 | 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.

|                                     |      |
|-------------------------------------|------|
| <b>Attendance and Participation</b> | 10%  |
| <b>Quizzes, Homework</b>            | 10%  |
| <b>Midterm</b>                      | 20%  |
| <b>Final</b>                        | 30%  |
| <b>Scanning Performance</b>         | 30%  |
| <b>Total</b>                        | 100% |

### Classroom Protocol:

- All students are expected to display professionalism, in preparation for hospital work. That means arriving on time, remaining quiet when others are speaking, and paying attention to whoever has the floor in the classroom.
- Students are expected to attend and be prepared for all regularly scheduled classes. If a student knows in advance that he or she will need to leave early, the student should notify the instructor before the class period begins.
- Students are expected to treat faculty and fellow students with respect. For example, students must not disrupt class by leaving and reentering during class, must not distract class by making noise, and must be attentive to comments being made by the instructor and by peers.
- Never speak while the instructor is speaking.
- Always raise your hand to speak or to leave your seat and wait for a response before speaking.
- **Disruptive behavior will not be tolerated**, including touching of other classmates or their belongings.
- Students engaging in disruptive behavior in class will be asked to leave and may be subject to other penalties if the behavior continues.
- No drinks, eating, sleeping or personal grooming is permitted during ultrasound laboratory classes.

- Please turn off your cell phones, and refrain from activities that disrupt the class (such as eating and walking in and out of the room while lab class is in session).
- If you use a computer in class, please use it 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, cell phone to surf the web, check emails, or send/receive text messages, as these activities are distracting to those around you (and decrease your chances of getting the most out of your time in class).
- To encourage the free flow of conversation, no part of any class may be recorded on audio or video media without the permission of the instructor. You may record notes by hand or by typing into a mobile computer.
- The presence of guests to listen to any part of a class requires the consent of the instructor.

### **ACADEMIC HONESTY:**

The University maintains a strict policy concerning academic dishonesty, which includes cheating, plagiarism, giving assistance on an examination or paper when expressly forbidden by the instructor, and any other practices which demonstrate a lack of academic integrity. It is the responsibility of the student to know and to adhere to principles of academic honesty. A student found guilty of academic dishonesty will be subject to academic sanctions ranging from assignment failure to course failure.

### **LECTURE SCHEDULE**

Lecture 1: Cardiac anatomy and physiology. Imaging planes

Lecture 2: Cardiac anatomy and physiology, hemodynamics, parasternal views. Quiz #1

Lab: Ultrasound ergonomics for a cardiac sonographer, entering data, patient preparation for the scanning, practice parasternal views.

Lecture 3: Cardiac conduction system, cardiac cycle, electrical and mechanical correlation, coronary circulation. Quiz #2

Lab: ECG tracing optimization. Image optimization, B-color map, systole, and diastole. Practicing parasternal views, identification left and right heart structures.

Lecture 4: Transthoracic views. Two-dimensional Echo views, parasternal long axis views and parasternal short axis views, apical views, subcostal and suprasternal views. Quiz #3

Lab: Practicing PLAX and PSAX, image optimization, electrical and mechanical events correlation.

Lecture 5: 2D measurements and calculations in parasternal views and LV function assessment. Quiz #4

Lab: Practicing 2D-imaging, optimization of images and use zoom on valves.

Lecture 6: Principles of M-Mode ECHO, measurements, and calculations. Quiz #5

Lab: Continue practicing 2D-imaging PLAX, PSAX, APICAL VIEWS.

**10/05/2022**

**Lecture: Midterm exam**

**10/11/2022**

**Lab: Midterm scanning exam**

Lecture 7: Doppler basics. Spectral Doppler. Color Flow Imaging.

Lab: Practice the sequence of the images and optimization.

Lecture 8: Evaluation of LV systolic function

Quiz #6.

Lab: Practice the sequence of the images and optimization.

Lecture 9: Coronary artery disease.

Quiz #7

Lab: Practice the sequence of the images and optimization.

Lecture 10: Cardiomyopathies. Hypertrophic Cardiomyopathy.

Quiz #8

**11/15/2022**

**Lab: Final scanning exam**

Lecture 11: Cardiomyopathies. Dilated Cardiomyopathy.

Lecture 12: Cardiomyopathies. Restrictive Cardiomyopathy

Quiz #9

Lecture 13: Aortic valve stenosis and regurgitation.  
Mitral valve stenosis and regurgitation.

Quiz #10

**11/22/2022 – 11/26/2022 Fall recess.**

**12/07/2019**

**Final exam**

Syllabus Revised on 08/2022 (the syllabus is subject to change at any time).