LINCOLN UNIVERSITY

DI 235 – Echocardiography Imaging
Fall 2025 Course Syllabus

Instructor: Dr. Oxana Ostanina
Lab Instructor: Dr. Ostanina
Course Schedule: Tuesday 9:00 AM – 11:45 AM (Lectures)
Tuesday 12:30 PM – 3:15 PM **(09/09/25 – 11/18/2025)** (Lab)
Credits: 4 units: 3 units of lectures and 1 unit of laboratories
(45 hours of lectures and 30 hours of laboratories)
Level: Advanced (Adv)
Office Hours: No assigned office hours,
e-mail instructor: ostanina@lincolnuca.edu
Pre-Requisite: DI 110

REQUIRED TEXTBOOK:

ASE's Comprehensive Echocardiography, 2nd edition, 2016, Roberto M. Lang et al
ISBN: 978-0-323-26011-4

Feigenbaum's Echocardiography, 8th edition, 2019, William F. Armstrong, Thomas Ryan
ISBN: 9781451194272

Textbook of Clinical Echocardiography, 4th edition, Catherine M. Otto, MD, 2009
ISBN-10: 1416055592, ISBN-13: 978-1416055594

The Echo Manual, 4th edition, Jae K. Oh, Gavan C. Kane, James B. Seward, A. Jamil Tajik, 2019
ISBN 9781496312198

Echocardiography: The Normal Examination and Echocardiographic Measurements, 3rd edition, Bonita Anderson, 2017

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

Last Revision: August 2025

NOTE: The Instructor may modify this syllabus and course schedule at any time, based on their judgment of what is best for the class. Any changes will be announced in advance in class.

CATALOG DESCRIPTION

Review of imaging methods and technology based on 2-dimensional echocardiography. Applications to recording and interpretation of echo imaging for the detection of heart abnormalities are emphasized. (4 units)

Learning Objectives

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

- Utilizing Two-dimensional echocardiography, identify and assess the normal and abnormal 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.
- 2D and M-mode Measurements – perform basic two-dimensional and M-mode measurements for each structure. Perform basic left ventricle linear measurements and calculations.
- Spectral and Color Doppler – identify direction of and velocity information given in the color and spectral Doppler images/waveforms, normal and abnormal.
- Basic Doppler Calculations – perform basic Doppler calculations, i.e., stroke volume, cardiac output, and valve areas.
- 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.
- Pharmacology – Name basic cardiac medications and their effect on the heart. Cite medications given for the most commonly encountered cardiac abnormalities, i.e., CHF, arrhythmias, etc.
- Normal Examination – Describe the ASE recommended views and measurements in the complete normal transthoracic echocardiogram.

COURSE LEARNING OUTCOMES[1]

Course LO	Program LO	Institutional LO	Assessment activities
Identify each anatomic region and segment of the heart from any given echocardiographic view; relate it to its usual coronary distribution. Identify abnormalities of resting cardiac wall motion and thickening using standard terminology; classify each according to its clinical significance	PLO 1 PLO 3	ILO 1a, ILO 2a, ILO 3a, ILO 4a	In-class activities
Discuss the basis, significance, and pitfalls of the following measures of cardiac function (ejection fraction & fractional shortening; % Wall thickening; MAPSE, TAPSE; Stroke volume; Cardiac output; Cardiac index; LV mass).	PLO 2	ILO 1a,	In-class activities, lab activities, quizzes
Identify and differentiate ventricular hypertrophy by chamber, type, and degree. Identify, stratify, and discuss the clinical significance of pericardial effusion in the assessment of suspected tamponade. Identify and discuss the image and Doppler parameters associated with subaortic obstruction.	PLO 3	ILO 1a, ILO 4a	In-class activities, lab activities, quizzes, midterm and final exams

INSTRUCTIONAL METHODS:

The lectures and other reading material will be provided by email or electronic format:

- Assigned text readings and lecture outlines (handouts)
- Internet resources
- Group discussions and ultrasound case analysis
- Quizzes & examinations
- Working with ultrasound machines
- Hands-on ultrasound laboratory trainings (protocols-handouts)
- Ultrasound laboratory - live and video demonstration
- Students' Ultrasound Hands-on Self-study

REQUIREMENTS:

[1] Detailed description of learning outcomes and information about the assessment procedure are available at the Learning Outcomes Assessment section of LU website.

- This is a lecture-lab course in which lecture topics are presented by the instructor (teacher), and the ultrasound hands-on lab practice is explained and demonstrated by the Lab Instructor (explanations and demonstrations by lab instructor).
- The student is expected to be prepared in advance before the class sessions.
- Being prepared includes the following: having read the text materials (e.g., textbook readings and lecture outlines) assigned for that day's activities and bringing required work materials (e.g., textbook, handouts, writing supplies, etc.) to the session.
- Homework will include reading the topic (s) for one week.
- The student is expected to attend and participate in all course lectures and activities, and complete all quizzes, examinations, and course assignments on time. Therefore, attendance and arriving on time are crucial to your final grade.
- The student must budget time efficiently and be realistic about all personal and professional commitments that consume time.

The University maintains a strict policy regarding academic dishonesty, which includes cheating, plagiarism, providing unauthorized assistance on an examination or paper, and any other practices that demonstrate a lack of academic integrity. It is the responsibility of each student to understand and adhere to the principles of academic honesty. A student found guilty of academic dishonesty will be subject to sanctions ranging from failure on the assignment to failure in the course.

SCANNING LAB RULES

Students are required to wear a university uniform with the logo and a face mask in the Lab.

Lab Hours:

- **Lab hours are posted on the front door.** Please respect class time, try not to enter when a class is in session, or be quiet if you come late.
- **Use student subjection envelope for questions or concerns.**
- **Sign in on the preferred machine** with your name, start time and finish time. You must re-sign in if you want to continue to scan after you finish it. Ask a lab assistant.
  Students are encouraged to use open lab time as needed.

Respect Others and Lab:

- **No eating or drinking in the lab.**
- **No cell phones** (exit the room if you must take a call).
- **Clean up after yourself** (table, transducer, put away chairs and other equipment, trash, etc.).
- **Inform the instructor or staff of needed supplies or equipment broken.**
- **Keep a low tone of voice.** The lab is small; speaking loudly can be very disruptive to students who need their concentration on scanning.
- **Do not interrupt students' scanning time.** Ask the students whether it is okay to ask them questions while they are scanning.

- Never leave your **personal property** unattended. Although Lincoln University does have a zero tolerance for theft, the university is not responsible for lost or stolen items. Any students caught stealing will be prosecuted.
- **Please do not remove any objects from the lab** (books and study materials).
- **Leave personal conversation outside the lab.**
- **Outside patients:** reconcile with the instructor or Lab assistant.
- **No children are allowed in the lab.**

Machines (Acuson, Phillips, and GE):

- Please kindly shut down the machine after the scanning class and check the cords; they should not be on the floor.
- Do not erase any information on machines (only instructors and lab assistants may do so).
- Please inform lab assistants of needed supplies (baby wipes, paper towels, gel).
- Wipe down the transducer and cords after every patient, using the antiseptic spray/wipes.
- Change paper after every patient, and place a pillow under the paper, not on top.
- Please safely move around the equipment (ultrasound machines, patient tables).

Ultrasound hands-on laboratory training

Ultrasound hands-on laboratory will involve primarily students' demonstration of the knowledge presented during lectures. Practical experience will be gained under the guidance of a supervisor (instructor). The syllabus set out includes a competency assessment sheet for training. This should be completed during training, as it will help to determine in which area(s) the student can practice independently. Students are expected to arrive at class on time and stay through the end of the Ultrasound laboratory class.

Ultrasound Hands-on Laboratory Examination

During the Hands-On Lab Examination, students should demonstrate:

1. The understanding of the information presented primarily during the lectures and hands-on laboratory training.
2. The knowledge of the anatomy, physiology, normal variations, and pathology of the human body. In-depth knowledge of the ultrasound scanning protocols and the ability to present images in a logical sequence.
3. The use of different acoustic windows to achieve the best picture quality possible.
4. The ability to select the proper transducer for the exam
5. The knowledge of the ultrasound machine capabilities for the optimal quality of diagnostic images (frequency, TGC, B-mode, focal zones, color scale, gain, depth, etc.).
6. The ability to describe optimal techniques related to field size, power, gain, and contrast for image interpretation.
7. Knowledge of the elements of image labeling
8. Explanation of the sonographic findings and differential diagnosis of abdominal pathology

   Since the intent of the lab examination is for the student to demonstrate the knowledge of the scanning protocol, students are not allowed to ask questions and discuss the

scanning procedures with classmates. Reference materials are not allowed during exams.

Attendance and Participation:

- **Tardy students, who arrive after the roll is taken, will be considered absent.**
- **Students are not allowed to be more than 10 minutes late.**
- **If you are late or absent, a valid excuse, such as illness, family emergency, or natural disaster, is expected.**
- **Three late arrivals would affect the grade.**
- **If you are late because of unforeseen heavy traffic more than 1 time during the semester, it will be considered as an absence.**
- **If a student arrives twice late for a one session (at the beginning of the class and after break, more than 5 minutes late) would be considered absent.**
- No requirements to make up any work missed as a result of an absence. However, it is your responsibility to obtain notes from other class members regarding the class session you missed.

COURSE GUIDELINES:

- To complete this course, the students must pass the midterm and final exam portions with a 70% or better. **Students should attend all the class meetings and labs. However, considering possible urgent situations, students may be absent from a maximum of one class meeting with prior notice to the instructor.**
- The term grade is based on attendance, class activity, project, midterm, and final examination. Individual projects will be assigned at the beginning of the semester. **The project is due by the last meeting. No project will be accepted after the due date.**
- If students have missed a class without a valid reason, no make-up for presentations will be allowed. **Midterm cannot be retaken. Final examination, if failed, can be retaken only once. If the subject fails the second time, the class is considered failed. The course is considered failed if the student fails the Lab final examination.** Dictionaries can be used during class time. No electronic devices during the test time. A student must take the exam during the scheduled time. 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. In such a circumstance, the student should make every reasonable attempt to contact the instructor before the exam period is over (or as soon as possible). While make-up exams will cover the same content area as a missed exam, the exam format and specific questions may be different.
- **During the exam, any student observed in a situation that could be considered suspicious (e.g., an open book or notebook within his/her field of vision, looking around or checking a cell phone, or other wireless devices, helping the examinee-sonographer to take images by guiding manually or verbally, etc.) but no cheating is observed, will be warned. Once warned, any applicant found cheating on the exam will fail the exam and be prohibited from retaking the exam without permission from the dean**.
- Students cannot leave the room during the test/exam. As soon as a student leaves, his/her exam is considered finished.

- A lecture is not a substitute for textbooks. Students should read textbooks, review lectures from previous courses, and use other sources to be prepared for the exam. The lecture is to guide the students to prepare for the course subjects.

Administrative policies on ABSENCES FROM CLASSES:

A student may be DISMISSED after missing 3 consecutive classes registered in a semester.

Homework:

The goal of the homework is to help students achieve the course learning objectives. Homework consists of two parts. The first part is to read the textbooks and materials to review and analyze the lecture given during a previous class session. Students are expected to spend six hours for each class session outside of class in completing the reading assignments related to each lecture. These assignments are graded through short quizzes given at the beginning of the following class session. The second part of the homework consists of a project presented at the end of the course. Each student will choose the topic for presentation or will be assigned one by the instructor. 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 the presentation. The images need to be dated and should indicate the student's name. The topic and format for the presentation will be discussed in class for more details. A final draft of the presentation must be submitted for review one week before the presentation.

Evaluation Criteria for 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

TESTING:

Quizzes:

Students will take 10 quizzes: 10-20 questions each. 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. Each quiz will be timed; 1 minute for every question to complete. No make-up quizzes for missed quizzes will be administered (students will receive no score for missed quizzes).

Ultrasound Hands-on Laboratory Examination:

- During the final ultrasound hands-on examination, students will have to demonstrate understanding of information presented during lectures and hands-on laboratory training.
- Students have to perform different ultrasound protocols and demonstrate scanning techniques and images in B-mode, M-mode, Color, and Spectral Doppler.

- Students are required to schedule a time and date 2-3 weeks ahead for the Ultrasound hands-on laboratory examination.
- Students need to be at the Ultrasound Lab, ready to start scanning at the exact scheduled time. (It is recommended that students arrive about 15 minutes before the scheduled exam time.)
- If a student is late for the scheduled exam time, the time **CANNOT** be changed, and the student **WILL NOT** get a full hour! The student will only have the remaining time left in the hour.
- Only one-time **RETESTS** will be given to students with a valid excuse such as illness, family emergency, unforeseen heavy traffic, or natural disaster.

Lab Grading:

Scanning Performance: 20%
Effective use of lab time, demonstrating development of scanning skills, applying scan techniques, and effective use of ultrasound machine controls (TGC, Depth PRF, Freq.)
Transducers, and improving images on each patient. Complete/full participation and working during class time is expected. Students are encouraged to use open lab time as needed. **Students are required to complete 12 hours in lab self-study.**

Attendance: 10%
Absences, late arrival, poor use of class time, and early leaves will result in students' poor or failing grades.

Ultrasound Hands-on Laboratory Examination:

- Final ultrasound hands-on examination student has to demonstrate understanding of information presented primarily during lectures and hands-on laboratory practice
- Students have to perform echocardiographic protocols and demonstrate scanning technique and images in B, Color, and M-mode.
- The student will schedule a time and date 2-3 weeks ahead the Ultrasound hands-on laboratory
  examination.
- Student(s) need to be at the Ultrasound Lab – ready to start scanning at the exact time you scheduled your exam for. (It is recommended that you arrive about 15 minutes before your scheduled exam time.)
- If a student is late for his/ her scheduled exam time, their time CANNOT be changed, and you will NOT get a full hour! If the student is late, he/she will only have the remaining time left in your hour. On exam days, you may come to class, but it is not mandatory until your scheduled exam time.

GRADING CRITERIA

GRADING FACTORS		%
LECTURE	Final Exam	20
	Midterm Exam	20
	Quizzes	10
	Attendance	10
	Presentation	10
LABORATORY	Scanning Performance	20
	Attendance	10
TOTAL		100

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

Absences, late arrival, poor use of class time, and early leaves will result in students' poor or failing grades.

Schedule: DI 235 – Echo Imaging

Weeks	Date (Lecture)	Lecture	Lab	Quiz
1	08/26/25	Review of Spectral and Color Doppler Cardiac Hemodynamic (M-Mode & Doppler, optimizing image)		
2	09/02/25	Valvular Disorder. Aortic valve		
3	09/09/25	Valvular Disorder. Mitral valve.	Spectral and Color Doppler Examination	1
4	09/16/25	Valvular Disorders. Tricuspid Valve	2-D Linear and Volumetric measurements	2
5	09/23/25	Valvular Disorders. Pulmonic valve	Tricuspid & Pulmonary Assessment	3
6	09/30/25		Doppler Assessment of Left Ventricle Systolic Function	4
7	10/07/25		Doppler Assessment of Left Ventricle Diastolic Function.	5
8	10/14/25	Mid-term Exam	Mid-term Exam	
9	10/21/25	Cardiomyopathies	Tricuspid & Pulmonary Assessment. Aortic valve assessment	6
10	10/28/25	Cardiomyopathies	2-D Linear and Volumetric measurements, Doppler Assessment of Ventricular Systolic Function	7
11	11/3/25	Cardiomyopathies	Aortic valve assessment Mitral valve assessment	8
12	11/17/25	Pericardial diseases. Pericardial Effusion, Tamponade.	Wall Motion Assessment	9
13	12/1/25	Diseases of the Aorta	Full protocol. Final Exam	10
14	12/8/25	Final Exam. Presentation		