

Bergen Community College
Division of Health Professions
Department of Diagnostic Medical Sonography

DMS-101 Ultrasound Physics and Instrumentation I

Course Information

Semester and Year:
Course and Section Number:
Meeting Times and Locations:
Instructor:
Office Location:
Phone:
Departmental Secretary:
Office Hours:
Email Address:

Course Description The course will provide the student with the relevant fundamental physical principles as well as the basic instrumentation used in diagnostic ultrasound. Modes of operation, imaging and display techniques that relate to high-frequency sound production will be stressed.

2 Credits

1 Lecture Hour
3 Lab Hours

Corequisites: *DMS 102, DMS 113, DMS 115*

Student Learning Outcomes: As a result of meeting the requirements in this course, students will be able to:

1. Discuss how ultrasound can produce images of the human body.
2. Define the parameters of a sound wave as well as the parameters of pulsed ultrasound.
3. Demonstrate how to use equipment related to ultrasound.
4. Explain the role of each component of an ultrasound instrument.
5. Adjust ultrasound machine controls to obtain a diagnostic image.

Means of Assessment: Students will be assessed in the following methods:
Final Exam, tests, quizzes, and lab assignments.

Course Content

Ultrasound Physics and Instrumentation II is a course that provides an in-depth study of the characteristics of ultrasound and its interaction with tissue by reflection, refraction, and absorption. Topics covered include Doppler ultrasound, image artifacts, ultrasound bioeffects, safety, quality assurance, and advances in ultrasound.

Course Texts and/or Other Study Materials

Kremkau, Frederick W. DIAGNOSTIC ULTRASOUND: PRINCIPLES AND INSTRUMENTS. W. B. Saunders Company. Philadelphia.

Grading Policy

Final is cumulative.

FINAL GRADE CALCULATION

Quiz average	25%
Test average	30%
Lab assignments	10%
Final Exam	35%

NUMERICAL GRADE CALCULATION

92 to 100	A
88 to 91.9	B+
83 to 87.9	B
79 to 82.9	C+
75 to 78.9	C
0 to 74.9	F

Academic Integrity Policy and Attendance Policy

Academic Integrity

Academic dishonesty is a serious violation of BCC policy and personal ethics and will be treated as such if the reason for suspicion should arise. Students should be careful to avoid plagiarism, falsification, and compliance. Academic integrity is vital to an academic community and for fair evaluation of student assessments. All assessments submitted must be your own, completed in accordance with the college's academic policies and the student code of conduct. You may not engage in unauthorized collaboration or make use of any artificial intelligence (AI) composition systems. Academic dishonesty also includes cheating on examinations. Refer to the [BCC student code of conduct](https://catalog.bergen.edu/content.php?catoid=4&navoid=163#academic-dishonesty), student handbook for additional information, and the statement on plagiarism (<https://catalog.bergen.edu/content.php?catoid=4&navoid=163#academic-dishonesty>).

BCC Attendance Policy

All students are expected to attend and be punctual for every scheduled meeting of each course in which the student is registered. Attendance and lateness policies and sanctions are to be determined by the director for each section of each course. These are in writing in the Policy and Procedure Student Handbook and in each course outline.

Other College, Divisional, and/or Departmental Policy Statements

Accommodations for Disabilities

Bergen community college aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on a disability should contact the Office of Special Services.

Americans with Disabilities Act: Students who require accommodations by the Americans with Disabilities Act [ADA] can request support services from "The Office of Specialized Services of Bergen Community College] 201-612-5270/5269 or via email at ossinfo@bergen.edu.

Mental Health and Well Being

Mental Health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. Bergen Community College has licensed personal counselors available to assist you with addressing these and other concerns you may be experiencing.

You can learn about the confidential mental health services available on campus via the Health and Wellness Center at www.bergen.edu/personal_counseling.

Student and Faculty Support Services Available Online and On-Campus Resources

[Library- https://bergen.edu/library/](https://bergen.edu/library/)

[Academic support https://bergen.edu/academics/pathway-scholars-program/academic-support](https://bergen.edu/academics/pathway-scholars-program/academic-support)

The Writing center and Tutoring Center- L-125 [https://Bergen.edu/tutoring/writing center/](https://Bergen.edu/tutoring/writing%20center/)
 OWL(Online Writing Lab) <http://www.owl.english.perdue>

Free Time Computer Labs [https://Bergen.edu/technology assistance/computer lab availability/](https://Bergen.edu/technology%20assistance/computer%20lab%20availability/)

The Center for student A-118 (Academic, Career, International, and Transfer Counselors)
<https://bergen.edu/center-for-student-success/>

Personal counseling HS-100 <https://bergen.edu/health-wellness-and-personal-counseling/personalcounseling/>

Sample Course Outline

Week	Topic/Activity	Assignments/Events
1	History of ultrasound, echo production, sound wave theory, ultrasound vs x-rays Lab: Introduction to the Ultrasound Machine – Knobology	
2	Transducer (crystal element), piezoelectricity, parameters and velocity of a sound wave Lab: Phantom Scanning lab	
3	Pulsed ultrasound, decibels, power, amplitude, and intensity Lab: Math lab, Kahoot Review	
4	Test #1	Test #1
5	Attenuation: definition, computation, and causes; reflections: specular and non-specular Lab: Free Time Scanning	
6	Impedance, perpendicular incidence Lab: Math lab, Attenuation lab	
7	IRC, ITC; Oblique incidence and refraction, Snell's Law Lab: Kahoot Review, Reflection/Refraction/Scattering Lab	
8	TEST #2	TEST #2
9	Pulse-echo range equation, scanning modes; transducer construction Lab: Free time scanning/Disabilities Lab	
10	Bandwidth, multi-hertz transducers, quality factor, characteristics of a sound beam Lab: Free time scanning/Disabilities Lab	
11	Detail resolution: axial and lateral; instrumentation: pulser, transducer, receiver Lab: Kahoot Review, M-Mode Lab	
12	Scanning Lab	
13	TEST #3	TEST #3
14	Instrumentation: image processors, memory, display Lab: Final exam review Kahoot	
15	FINAL EXAMINATION (CUMULATIVE)	FINAL EXAMINATION (CUMULATIVE)

Note to Students: This Course Outline and Calendar is tentative and subject to change, depending upon the progress of the class.