



Course Syllabus

Course title: Sonography Principles & Instrumentation 1

Class section: MIDS - 139 - X01A

Term: 2025S

Course credits: 3

Total hours: 75

Delivery method: In-Person

Territorial acknowledgment

Camosun College respectfully acknowledges that our campuses are situated on the territories of the Lək̓ʷəŋən (Songhees and Kosapsum) and W̱SÁNEĆ peoples. We honour their knowledge and welcome to all students who seek education here.

Instructional hours

Lecture hours: 3 per W

Lab hours: 2 per W

W = Week

T = Term

Instructor details

Name: Matthew Barbas

Email: BarbasM@camosun.ca

Course description

Course Description:

Students examine the function and safe operation of ultrasound equipment, transducers, and accessory equipment found in diagnostic medical sonography environments. Students learn about the underlying physical and electronic principles of producing two-dimensional and three-dimensional anatomic and flow imaging using sounds pitched higher than that of human hearing. Students learn how to use special instruments to produce anatomic images generated by pulse-echo techniques. By identifying factors necessary for successful image production and considering conditions negatively affecting image quality, students learn how to operate ultrasound equipment properly.

Prerequisites:

One of:

- B in English 12
- B in Camosun Alternative

And one of:

- B in Physics 12
- B in Camosun Alternative
- B in PHYS 105
- C+ in PHYS 165

Learning outcomes

Upon successful completion of this course a student will be able to:

1. Explain and apply the fundamental principles of waves as they pertain to medical imaging.

2. Explain the influence of pulse-echo technique on image formation, resolution, and framerates.
3. Describe how the components and function of ultrasound equipment interrelate to produce diagnostic images.
4. Describe how the major components of a diagnostic medical sonography systems interrelate to create, process, store, and retrieve a digital image.
5. Explain how flow and Doppler are used in ultrasound imaging.
6. Compare and contrast the use of A-mode, B-mode, M-mode, and Doppler Imaging (Colour Doppler, Pulsed Wave or Spectral Doppler, and Power Doppler) for obtaining images.
7. Discuss problem solving, troubleshooting, and corrective actions for errors in equipment selection, operation, malfunction and other technical errors suggested by image artifacts.
8. Explain the bioeffects of diagnostic ultrasound and current practice standards, American Institute of Ultrasound in Medicine, and Health Canada statements as they apply to risk, safety considerations, and elements of prudent practice.

Competency mapping

Sonography Canada Competencies:

- 4.1a Select optimum system and transducer for examination considering patient's age and size, structures being examined and specific indications for examination.
- 4.2c Monitor output display indices and adjust power output in accordance with "as low as reasonably achievable" (ALARA) principle.
- 4.2d Adjust instrument controls to optimize image.
- 4.2e Identify artifacts.
- 5.4c Understand the variables and their relationships within calculations.

Course materials

Miele, F. R. (2022). *Ultrasound physics and instrumentation* (6th ed., Vol. 1). Pegasus Lectures, Inc.

Desire-to-Learn (D2L):

- D2L – the Camosun College online learning portal contains the remainder of the learning materials for this course. Students are expected to familiarize themselves with the online learning environment and all the features it has to make this course experience enriching. Log on at <https://online.camosun.ca/> to access these materials.
- Additional resources may include, but are not limited to: lecture notes, PowerPoint slides, Laboratory Manuals, and hyperlinks. You may prefer to download lectures notes ahead of time (when available) and then write your notes directly onto copies of the slides. YouTube and other media services will also be used throughout the course via public domains.
- D2L materials must not be considered your sole source of information. The materials in D2L simply summarize the main points and provide direction for your learning experiences. You may need to write down additional information in each lecture. Additionally, not all details can be covered in a lecture, and you will be required to refer to textbook material that is not discussed specifically in class.

Course schedule

Week	Date (2025)	Lesson	Readings	Learning Outcomes	Learning Objective	Sonography Canada Competency	Asses
1	May 5	1. Introduction to sonography principles and instrumentation 2. Foundational Mathematics in Diagnostic Ultrasound (Online-Asynchronous)	Chapter 1: Mathematics Pg. 1-26	a	1.0-3.2	4.2c	Practi Introdi sonog princip instrur
		Lab 1: Orientation to the Ultrasound Lab		a	4.0-4.4		

		and Ultrasound Console					
2	May 12	1. Sound Wave and Pulsed Wave Ultrasound Principles 2. Attenuation Ultrasound Principles	Chapter 2: Waves Chapter 3: Attenuation Pg. 72-74, 83-85 Chapter 4: Pulsed Wave Operations Pg. 104-115, 122-123, 126-129	a, b	5.0-5.10	5.4c	Quiz 1 Found for Mathe Diagn Ultras
		Lab/Tutorial: Pulsed Ultrasound and Attenuation review questions		a,b	6.0,6.1	5.4c	
3	May 19	1. Victoria Day – No Class Monday 😊 2. Image Formation with Echoes	Chapter 3: Attenuation Pg. 74-101	b	7.0 – 8.16	5.4c	Quiz 2 Sound and P Ultras Principi
		Lab 2: Applying Ultrasound Principles in Attenuation		b	9.0 – 9.3		
4	May 26	1. Construction and Operation of Transducers	Chapter 5: Transducers Part 1 and Part 2	c, d	10.0 – 10.10	4.2d	Quiz 3 Attenu and In Forma Echoe

		2. Types of Transducers and Electronic Phasing					
		Lab 3: Image Formation of Echoes (Acoustic Impedance, Refraction, Scattering, Speckle)		b	11.0-11.3		
5	June 2	1. Imaging Resolution 2. Test Review with US Systems and Questions	Chapter 5: Transducers Part 1 Pg 146-150 Chapter 4: Pulse Wave Operation Pg. 116-120	b, c, d	12.0 – 13.8	4.1a	Quiz 4 Const Trans Beam Focus
		Lab 4: Transducer Guide and Imaging Resolution		c, d	14.0-14.1	4.1a	Lab Assign Due
6	June 9	1. Sonographic Instrumentation (Beam Former) 2. Signal & Image Processor	Chapter 6: System Operation Part 1 Pg. 204-248	d	15.0-15.5		Quiz 5 Types Trans Imagin Resol
		Lab Flex Time for Lab Assignment		b,c		4.2d	Lab Assign Due
7	June 16	1. Test Review	Chapter 4: Instruments: Imaging	d	16.0-16.13		

		2. Mid-Term Test (June 18)	Anatomy with Principle 1				
		Lab 5: Pre and Post Processing Functions			17.0- 17.10	4.2d	
8	June 23	1. Types of Flow and the Doppler Effect 2. PACS, DICOM, HIS, and Digital Storage	Chapter 7: Doppler	b, d, f	18.0-19.6		Quiz 6 Principi Instru Beam Signal Image Proce
		Online Lab Asynchronous: Contemporary Features		d			
9	June 30	1. Colour and Power Doppler 2. Flex Day – July 2	Chapter 7: Doppler	e, f	21.0 – 21.13, 23.0-23.2		Quiz 7 and th Doppl
		Lab 6: Colour and Power Doppler Instrumentation					
10	July 7	1. Spectral Doppler	Chapter 7: Doppler	f	22.0 – 22.12		Quiz 8 and P Doppl

		2. Doppler Applications					
		Lab 7: Spectral Doppler Instrumentation		f	26.0 – 26.6		
11	July 14	1. Imaging Anatomy, Motion and flow with Principle 2 2. 2-D Ultrasound Artifacts	D2L Reading, Chapter 8: Artifacts	g	24.0 – 25.6	4.2e	Quiz 9 Spectral Doppler
		Lab 8: Analyzing and Resolving 2D Ultrasound B-Mode artifacts		g	28.0 – 28.3	4.2e	
12	July 21	1. Doppler Imaging Artifacts 2. Imaging artifacts review	Chapter 8: Artifacts	g,h	27.0-27.1	4.2e	Quiz 10 Ultrasound Imaging Artifacts
		Lab 9: Doppler Imaging Artifacts		g	29.0 – 29.2	4.2e	Lab Assignment Due
13	July 28	1. Safety and Bioeffects of Ultrasound	Chapter 9: Bioeffects				
		Lab 9 – Flex Time					Lab Assignment

							Due
14	Aug. 4	1. BC Day No Class Monday 😊 2. Test Review					
15	Aug. 11		Final Exam				

Assessment and evaluation

Type	Description	Weight
Quizzes	10 Quizzes	15%
Assignment	Lab Assignments (four at 5% each)	20%
Examination	Midterm	30%
Examination	Final	35%

Course guidelines and expectations

Refer to the Diagnostic Medical Sonography (SONO) Program Handbook for classroom and lab etiquette as well as professional behaviour expectations.

Students must achieve a minimum of 65% for their final grade to pass the course and to use this course as a pre or co-requisite.

Asynchronous materials guidelines. There is weekly asynchronous material in the form of video lecture content, textbook readings and links to websites that must be reviewed to be successful in the course.

To achieve the program learning outcomes and course learning objectives, the use of generated artificial intelligence (AI) tools is prohibited unless explicitly stated on the course syllabus. If AI tools

are used when not permitted, this would be a violation of Camosun College's Academic Integrity Policy and students may be subject to sanctions as per the policy.

Do not book travel or flights until the final examination schedule has been published by the registrar.

School or departmental information

Health & Human Services Student Handbook: <http://camosun.ca/learn/school/health-human-services/student-info/index.html>

General Practicum Information: <http://camosun.ca/learn/school/health-human-services/student-info/practicum-info.html>

Allied Health & Technologies Department Handbooks:

- Certified Medical Laboratory Assistant: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/cmla.html>
- Diagnostic Medical Sonography: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/sono.html>
- Medical Radiography: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/mrad.html>

Students enrolled in Allied Health & Technologies Programs must achieve a minimum of 65% or a “COM” in each of their courses to use their course as a pre-requisite and progress in their program.

Students enrolled in Allied Health & Technologies Programs must participate in learning activities that include intimate and direct personal contact with their classmates during supervised practice. Students are training to perform the duties of a healthcare professional. These duties usually require constant, close physical contact with patients and clients. Students may be required to simulate and perform these activities on one another during this course. Students may also be required to use special hygiene practices and protective gear to protect themselves from the transmission of communicable diseases (like COVID-19). Risks associated with learning and performing the physical duties of a healthcare profession cannot be entirely eliminated by any amount of caution or protection. Students who refuse, or are incapable of participating and performing these activities due to personal or medical limitations, may only continue to participate in their course work when supported by officially registered accommodations or temporary medical advisory.

College policies and student responsibilities

The college expects students to be responsible, respectful members of the college community. Responsible students meet expectations about attendance, assignments, deadlines, and appointments. They become familiar with academic policies and regulations, and their rights and responsibilities.

College policies are available online at the [Policies and Directives](#) page. Academic regulations are detailed on the [Academic Policies and Procedures for Students](#) page.

Policies all students should be familiar with include the [Academic Integrity Policy](#). This policy expects students to be honest and ethical in all aspects of their studies. It defines plagiarism, cheating, and other forms of academic dishonesty. Infractions of this policy can result in loss of marks or a failing grade. To learn more about plagiarism and cheating, including the use of artificial intelligence, review the [Academic Integrity Guide](#).

The [Academic Accommodations for Students with Disabilities Policy](#) defines how Camosun provides appropriate and reasonable academic accommodations. The Centre for Accessible Learning (CAL) coordinates academic accommodations. Students requiring academic accommodations should request and arrange accommodations through CAL. Contact CAL at least one month before classes start to ensure accommodations can be put in place in time. Accommodations for quizzes, tests, and exams must follow CAL's booking procedures and deadlines. More information is available on the [CAL website](#).

Students must meet the grading and promotion standards to progress academically. More information is available in the [Grading Policy](#).

The college uses two grading systems. A course will either use the standard letter grade system (A+ to F) or a competency-based approach with grades of complete, completed with distinction or not completed. Visit the [Grades/GPA page](#) for more information.

Students must meet the college's academic progress standards to continue their studies. A student is not meeting the standards of progress when a GPA falls below 2.0. The college offers academic supports for students at risk of not progressing. The [Academic Progress Policy](#) provides more details.

If you have a concern about a grade, contact your instructor as soon as possible. The process to request a review of grades is outlined in the [Grade Review and Appeals Policy](#).

The [Course Withdrawals Policy](#) outlines the college's requirements for withdrawing from a course. Consult the [current schedule](#) of deadlines for fees, course drop dates, and tuition refunds.

If students experience a serious health or personal issue, they may be eligible for a [medical or compassionate withdrawal](#). The [Medical/Compassionate Withdrawal Request Form](#) outlines what is

required.

The [Acceptable Technology Use](#) policy ensures the use of the college network and computers contribute to a safe learning environment. This policy also applies to the use of personal devices with the college network.

Students experiencing sexual violence can get support from the Office of Student Support. This Office of Student support is a safe and private place to discuss supports and options. More information is available on the [sexual violence support and education site](#). Students can email oss@camosun.ca or phone 250-370-3046 or 250-370-3841.

The [Student Misconduct Policy](#) outlines the college's expectations of conduct. Students should behave to contribute to a positive, supportive, and safe learning environment.

The [Ombudsperson](#) provides an impartial, independent service to help students understand college policies.

Services for students

Successful students seek help and access college services. These services are recommended to make the most of your time at college.

Services for Academic Success

- [Career Lab](#): Connects students with work-integrated learning experiences, including co-op placements and career fairs.
- [English, Math, and Science Help Centres](#): Get one-on-one help with homework.
- [Library](#): Get help with research, borrow materials, and access e-journals and e-books. Libraries at both campuses provide computers, individual and group study spaces.
- [Makerspace](#): A place to innovate, collaborate, and learn new skills and technology in a fun, dynamic, inclusive environment.
- [Writing Centre & Learning Skills](#): Get assistance with academic writing or meet with a learning skills specialist for help with time management, preparing for exams, and study skills.

Enrolment, Registration, and Records

- [Academic Advising](#): Talk to an academic advisor for help with program planning.
- [Financial Aid and Awards](#): Learn about student loans, bursaries, awards, and scholarships.
- [Registration](#): Get information about Camosun systems, including myCamosun, and college policies and procedures.

- [Student Records](#): Get verification of enrolment to access funding, request a transcript, or credential.

Wellness and Cultural Supports

- [Counselling](#): It's normal to feel overwhelmed or unsure of how to deal with life's challenges. The college's team of professional counsellors are available to support you to stay healthy. Counselling is free and available on both campuses. If you need urgent support after-hours, contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.
- [Centre for Indigenous Education and Community Connections](#): Provides cultural and academic supports for Indigenous students.
- [Camosun International](#): Provides cultural and academic supports for international students.
- [Fitness and Recreation](#): Free fitness centres are located at both campuses.

For a complete list of college services, see the [Student Services](#) page.

Changes to this syllabus

Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change the course content or schedule. When changes are necessary the instructor will give clear and timely notice.