Course Outline

Ultrasound Physics and Instrumentation

RADY 5030 Study Period 5 - 2023

External - Online

University of South Australia

Introduction

Welcome

Welcome to Ultrasound Physics and Instrumentation.

For many of you, this will be your first core course in your graduate diploma of medical sonography (general, vascular, cardiac), breast imaging or graduate certificate in sonography. Most of you will already have training positions and access to an ultrasound machine which will help greatly. This course will provide you with an insight into the physics behind producing and optimising a real-time ultrasound image. By the end of the course, you will be expected to be familiar with the background physics of ultrasound and have developed an understanding of the acoustic properties of tissue, transducers, focussing methods, resolution, signal processing and modes of display, real-time principles, artefacts and Doppler physics.

Your main resource is the learnonline page. This contains all the information about what you are studying and your assessments. Please login to the learnonline page and introduce yourself in the arrival forum as your first port of call.

Communication with students in this course is primarily through the online discussion and the news forum. I encourage you to post all your queries on the discussion board, however I am available for contact via email on emilie.rasheed@unisa.edu.au

All the best for your studies in this course.

Emilie

Academic Work Definitions

External mode includes online, distance education, industry placement or directed research. Virtual classrooms are deemed to be an external mode of delivery. External mode does not normally include a face to face component, however some courses offered in external mode may require a small component of on-campus activity, or practical sessions.

The expectations of your activity and preparation for each course will be aligned to the activity being undertaken. For example, if you are studying externally and there are virtual lectures, your preparation would be as listed under the lecture section of this guide.

You may also be supported through online facilitation, with preparation required, and other learning activities provided in your course, that will each have specific preparation requirements for you. These requirements should be set out in individual course guides.

Peer Interaction is usually included in UniSA courses in both external and internal modes of delivery and is considered a critical element of the learning process that may involve activities, projects, discussion forums, presentations, practicals, workshops.

Online facilitation

Student information

Online courses generally require students to independently read, view and/or work through all required materials, including pre-recorded presentations that have been produced and provided to facilitate this form of learning.

Independent online learning is supported by Online Facilitators who supplement online teaching resources by facilitating, monitoring and moderating online forums; answering student queries via virtual office hours or help desks, online dialogue and/or phone conversations, providing formative feedback on your work or explaining comments and marking of your prior work.

Students are expected to be familiar with all relevant course content, including materials provided and assessments, and engage appropriately with facilitators within the timeframes provided.

Course Teaching Staff

Course Coordinator:	Mrs Emilie Rasheed
Location:	UniSA Allied Health & Human Performance
Telephone:	+61 8 8302 2708
Email:	Emilie.Rasheed@unisa.edu.au
Staff Home Page:	people.unisa.edu.au/Emilie.Rasheed

* Please refer to your Course homepage for the most up to date list of course teaching staff.

Contact Details

UniSA Allied Health & Human Performance

Physical Address:	Level 8, Centenary Building UniSA City East Campus Adelaide 5000
Website:	https://www.unisa.edu.au/about-unisa/academic-units/allied-health-and-human-performance/

Course Overview

Prerequisite(s)

There are no prerequisite courses to be completed before this course can be undertaken.

Corequisite(s)

There are no corequisite courses to be completed in conjunction with this course.

Course Aim

The aim of this course is to introduce students to the physical principles and instrumentation of diagnostic medical ultrasound.

Course Objectives

On completion of this course, students should be able to:

CO1. Give an account of the physical principles of ultrasound.

CO2. Explain the components and performance of diagnostic ultrasound equipment including image optimisation and recent advances

CO3. Identify A, B and M-mode principles and the principles of real time ultrasound.

CO4. Explain the principles of Doppler ultrasound including the application of PW, CW and colour doppler in ultrasound practice.

CO5. Describe the interaction of medical ultrasound with biological tissue and possible biological effects.

CO6. Recognise and explain the formation of artefacts within greyscale and doppler images.

Upon completion of this course, students will have achieved the following combination of Graduate Qualities and Course Objectives:

	Graduate Qualities being assessed through the course						
	GQ1	GQ2	GQ3	GQ4	GQ5	GQ6	GQ7
CO1	•			•		•	
CO2	•	•	•	•	•	•	
CO3	•	•	•	•	•	•	•
CO4	•		•		•	•	
CO5	•	•	•			•	
CO6	•	•	•	•		•	

Graduate Qualities

A graduate of UniSA:

GQ1. operates effectively with and upon a body of knowledge of sufficient depth to begin professional practice

GQ2. is prepared for life-long learning in pursuit of personal development and excellence in professional practice

GQ3. is an effective problem solver, capable of applying logical, critical, and creative thinking to a range of problems

GQ4. can work both autonomously and collaboratively as a professional

GQ5. is committed to ethical action and social responsibility as a professional and citizen

GQ6. communicates effectively in professional practice and as a member of the community

GQ7. demonstrates international perspectives as a professional and as a citizen

Course Content

Fundamental ultrasound physics, acoustic properties of tissue, transducers, focusing methods, resolution, signal processing, modes of display, real–time principles and instrumentation, digital signal and image processing, principles of Doppler ultrasound, contrast agents, biological effects, image recording devices, quality control, equipment selection, image optimisation, greyscale and Doppler artefacts and recent advances in medical sonography.

Teaching and Learning Arrangements

External (Online) 13 weeks

Unit Value

4.5 units

Use of recorded material

This course will involve the production of audio and/or video recordings of UniSA students. To protect student privacy, you must not at any time disclose, reproduce or publish these recordings, or related material, in the public domain including online, unless the videoed students give consent for reproduction, disclosure or publication. This requirement is consistent with University statutes, by-laws, policies, rules and guidelines which you agreed to abide by when you signed the Student Enrolment Declaration.

Student recording of learning activities

Students must seek permission prior to recording any UniSA learning activity. See A-56 Policy Student recording of learning activities (https://i.unisa.edu.au/siteassets/policies-and-procedures/docs/academic/a56_student-recording-of-learning-activities.pdf)

Breaches of this Policy contravene the principles of academic integrity, and attract the penalties provided in the Academic Integrity Procedure (https://i.unisa.edu.au/policies-and-procedures/university-policies/).

Learning Resources

Textbook(s)

You will need continual access to the following text(s) to complete this course. Where possible the Library will make the book available for student use. Please check the Library catalogue before purchasing the book(s). The Library will always seek to purchase resources that allow an unlimited number of concurrent users, however availability is dependent on license arrangements with book publishers and platforms. http://www.library.unisa.edu.au

- *Online resources will be advised*.

Reference(s)

Online resources will be provided. Please see the learnonline page for details

learnonline course site

All course related materials are available on your learnonline course site which you will be able to access from the ‘my Current Studies’ section in myUniSA (https://my.unisa.edu.au).

Access to Previous Courses
You will have access to your previous course sites for a period of 4 years. After this time, the course sites will be archived and will be unavailable.

Note: Course readings provided via the University Library are only made available to current students and staff due to licensing and copyright restrictions. Students may download their course readings while they are enrolled in the course for their personal research purposes only.

Assessment

Academic Integrity

Academic integrity is the foundation of university life and is fundamental to the reputation of UniSA and its staff and students. Academic integrity means a commitment by all staff and students to act with honesty, trustworthiness, fairness, respect and responsibility in all academic work.

An important part of practising integrity in academic work is showing respect for other people's ideas and being honest about how they have contributed to your work. This means taking care not to represent the work of others as your own. Using another person's work without proper acknowledgement is considered Academic Misconduct, and the University takes this very seriously.

The University of South Australia expects students to demonstrate the highest standards of academic integrity so that its qualifications are earned honestly and are trusted and valued by its students and their employers. To ensure this happens, the University has policies and procedures in place to promote academic integrity and manage academic misconduct. For example, work submitted electronically by students for assessment will be examined for copied and un-referenced text using the text comparison software Turnitin http://www.turnitin.com.

It is an offence for any person or company to provide academic cheating services to students of Australian universities, irrespective of whether the service is provided by an Australian or overseas operator (see Tertiary Education Quality and Standards Agency Amendment (Prohibiting Academic Cheating Services) Bill 2019 - https://www.legislation.gov.au/Details/C2020A00078). “Academic cheating services” includes providing or undertaking work for students, where that work forms a substantial part of an assessment task.

More information about academic integrity and what constitutes academic misconduct can be found in the Academic Integrity Policy and Procedure (https://i.unisa.edu.au/policies-and-procedures/university-policies/academic/ab-69).

To learn more on academic integrity and how to avoid academic misconduct, please refer to the Academic Integrity Module: https://lo.unisa.edu.au/mod/book/view.php?id=252142

Important information about all assessment

All students must adhere to the University of South Australia's procedures about assessment: http://i.unisa.edu.au/policies-and-procedures/codes/assessment-policies/.

Assessment Details

Details of assessment submission and return are listed under each assessment task. Assessment tasks will be returned to you within 15 working days of submission.

Cover sheets

A cover sheet is not required for assessment tasks submitted via learnonline, as the system automatically generates one.

If the Course Coordinator allows submissions in hard copy format, you will be required to attach an Assignment Cover Sheet which is available on the learnonline student help (https://asklearnonline.unisa.edu.au/app/answers/detail/a_id/2222/kw/coversheet) and in myUniSA.

Assessment Descriptions

Assessment 1

Single	15% of Course Total	Objectives being assessed:CO1

Title	Team work	Length	Duration	Due date (Adelaide Time)	Submit via	Re-Submission	Re-Marking
Key Concept Presentation 1	No	500 words	-	3 Sep 2023, 11:59 PM	learnonline	No	No

Further information on re-marking and re-submission is available in the academic policy, AB-68 P4 Re-marking and Re-submission Procedure

Please see assessment tab of learnonline site for further detail

Assessment due dates are staggered. Please see roster on learnonline site.

Assessment 2

Single	25% of Course Total	Objectives being assessed:CO1, CO2, CO3

Title	Team work	Length	Duration	Due date (Adelaide Time)	Submit via	Re-Submission	Re-Marking
Key Concept Presentation 2	No	1000 words	-	5 Nov 2023, 11:59 PM	learnonline	No	No

Further information on re-marking and re-submission is available in the academic policy, AB-68 P4 Re-marking and Re-submission Procedure

Please see assessment tab of learnonline site for further detail

Assessment due dates are staggered. Please see roster on learnonline site.

Assessment 3

Single	45% of Course Total	Objectives being assessed:CO1, CO2, CO3, CO4, CO5, CO6

Title	Team work	Length	Duration	Due date (Adelaide Time)	Submit via	Re-Submission	Re-Marking
Key Points and Presentation Answers Portfolio.	No	2500 word equivalent	-	10 Nov 2023, 11:59 PM	learnonline	No	No

Further information on re-marking and re-submission is available in the academic policy, AB-68 P4 Re-marking and Re-submission Procedure

Please see description in assessments section of the learnonline site.

Assessment 4

Single (Continuous)	15% of Course Total	Objectives being assessed:CO1, CO2, CO3, CO4, CO5, CO6

Title	Team work	Length	Duration	Sub-weighting	Due date (Adelaide Time)	Submit via	Re-Submission	Re-Marking
Compulsory Quiz 1	No	-	10 mins	25%	13 Aug 2023, 11:59 PM	learnonline	No	No
Compulsory Quiz 2	No	-	10 mins	25%	27 Aug 2023, 11:59 PM	learnonline	No	No
Compulsory Quiz 3	No	-	10 mins	25%	17 Sep 2023, 11:59 PM	learnonline	No	No
Compulsory Quiz 4	No	-	10 mins	25%	12 Nov 2023, 11:59 PM	learnonline	No	No

Further information on re-marking and re-submission is available in the academic policy, AB-68 P4 Re-marking and Re-submission Procedure

Please complete the online quizzes as they appear within the modules.

Feedback proformas

The feedback proforma is available on your course site.

Further Assessment Information

The use of artificial intelligence (AI) tools is **not** permitted in this course. Turnitin will identify text developed by AI and students using these tools will be in breach of academic integrity and will be reported to the academic integrity officers.

The assessment tasks for this course require you to demonstrate your learning.
It is important to understand that information generated by GenAI tools, such as ChatGPT, Copilot, and DALL-E, may be unreliable, inaccurate, and incorrect. It is your responsibility to comply with the conditions for each assessment tasks summarised in the assessment description and that any use of GenAI tools is ethical and responsible and adheres to the assessment conditions.
Use of GenAI tools that extends beyond the stated assessment conditions will be considered a breach of academic conduct, as per the Academic Integrity Policy (AB-69).

Additional assessment requirements

Students must submit each assessment component to obtain a pass for this course as per accreditation requirements.

Penalties for late submission

Penalties for late submission are applicable in this course.

All extensions **MUST** be applied for using the **extensions link in the learnonline site** PRIOR to 5pm Adelaide time on the last business day before the due date for the assignment. Extensions of 7 days or less will be automatically granted. A maximum extension time of two weeks will be granted with supporting documentation i.e. doctors certificates, supporting letter from employer etc.

Late submission of assessment tasks in this course will result in a penalty unless an extension has been granted or the student can provide evidence of unexpected or exceptional circumstances.

The penalty for late submissions will be:

1. a deduction of 10% of the available marks, for each day (or part thereof) that the assignment is late up to a maximum of 5 days.

Thus, for an assessment item that is one day late the maximum mark available will be 90%, and for two days late 80% etc. By way of example, if a student achieved a mark of 65% for an assignment that was submitted one day late, their adjusted mark would be 65% of a total available mark of 90%, so the mark would be adjusted to 58.5%.

2. assignments which are more than 5 days late may not be assessed and will be assigned a zero grade inclusive of non-graded pass work. Whether or not an assignment that is more than 5 days late will be assessed will be at the discretion of the Course Coordinator.

Rationale for Late submission of assessment tasks policy
If unexpected or exceptional circumstances occur that result in late submission, or if an extension has been granted for an assessment item, there will be no penalty.

However, where no extension has been granted, and there were no unexpected or exceptional circumstances that resulted in late submission a penalty will be applied. This is to prevent students from seeking to obtain an unfair advantage, compared with their peers, by having more time to complete an assessment item.

It was considered that if a student were to work on an assessment item for one day they might be able to improve their mark by 10%, so a 10% penalty has been applied to offset any such advantage that might be gained.

The 10% deduction will be from the available mark rather than the achieved mark to ensure equity between students. By way of example:

1) If a student achieved a mark of 77 (Distinction), but the assessment item was submitted two days late, their grade becomes 77% of 80 = 61.6 which is a true 20% reduction.
If the 20% deduction were applied to the achieved mark this would be 77% - 20% = 57%, which would actually represent a 26% reduction of their achieved grade.

2) If a student achieves a mark of 54 (P2) and is 2 days late in submitting the assessment item, their grade becomes 54% of 80 = 43.2 which is a true 20% reduction. If the 20% deduction were applied to the achieved mark this would be 54% - 20% = 34% which represents an actual 37% reduction of their achieved grade.

Thus, if the deduction were applied to the achieved mark both students would experience a different real deduction depending on the actual mark they achieved. Thus, in the interest of student equity the deduction will be taken from the available mark.

Exam Arrangements

This course does not have an exam

Deferred Assessment or Examination

Deferred assessment or examination is available for this course.

Supplementary Assessment

Supplementary assessment or examination offers students an opportunity to gain a supplementary pass (SP) and is available to all students under specific conditions unless supplementary assessment or examination has not been approved for the course.

Specific conditions and further information is available in the Variations to Assessment Procedure. http://i.unisa.edu.au/policies-and-procedures/codes/assessment-policies/

Special Consideration

Variations to assessment tasks

Details for which variation may be considered are discussed in the Variations to Assessment Procedure (http://i.unisa.edu.au/policies-and-procedures/codes/assessment-policies/). Variation to assessment in unexpected or exceptional circumstances should be discussed with your course coordinator as soon as possible.

More information about variation to assessment is available in the Variations to Assessment Procedure (http://i.unisa.edu.au/policies-and-procedures/codes/assessment-policies/).

Students with disabilities or medical conditions please refer to **Students with disabilities or medical conditions**.

Students with disabilities or medical conditions

Students with disabilities or medical conditions or students who are carers of a person with a disability may be entitled to a variation or modification to standard assessment arrangements. See the Variations to Assessment Procedure at: http://i.unisa.edu.au/policies-and-procedures/codes/assessment-policies/ and Policy C7 Students with Disability at: https://i.unisa.edu.au/policies-and-procedures/university-policies/corporate/c-7/

Students who require variations or modifications to standard assessment arrangements must first register for an Access Plan with the UniSA Access & Inclusion Service. It is important to contact the Access & Inclusion service early to ensure that appropriate support can be implemented or arranged in a timely manner.

Students who wish to apply for an Access Plan must book an appointment with a UniSA Access & Inclusion Advisor by contacting Campus Central or via the Online Booking System in the Student Portal. For more information about Access Plans please visit: https://i.unisa.edu.au/students/student-support-services/access-inclusion/

Once an Access Plan has been approved, students must advise their Course Coordinator as early as possible to ensure that appropriate supports can be implemented or arranged in a timely manner.

Students are advised there are also strict deadlines to finalise Access Plan arrangements prior to examinations. Further information is available at: http://i.unisa.edu.au/campus-central/Exams_R/Before-the-Exam/Alternative-exam-arrangements/

Action from previous evaluations

The exam for this course has been removed following previous evaluation of the course. This has been replaced with individual presentations of key module concepts and more detailed learning of key concepts in order to enhance understanding of the material.

Course Calendar

Study Period 5 - 2023

	Weeks	Topic	Assessment Details (Adelaide Time)
	10 - 16 July	Pre-teaching	
	17 - 23 July	Pre-teaching	
1	24 - 30 July	Module 1 - Interactions of Ultrasound with Tissue	
2	31 July - 6 August	Module 1 - Interactions of Ultrasound with Tissue	
3	07 - 13 August	Module 2 - Pulsed Ultrasound and Transducers	Compulsory Quiz 1 due 13 Aug 2023, 11:59 PM
4	14 - 20 August	Module 2 - Pulsed Ultrasound and Transducers	
5	21 - 27 August	Module 3 - Signal Processing	Compulsory Quiz 2 due 27 Aug 2023, 11:59 PM
6	28 August - 3 September	Module 4 - Additional Modes and Capabilities	Key Concept Presentation 1 due 03 Sep 2023, 11:59 PM
7	04 - 10 September	Module 5 - Artefacts	
8	11 - 17 September	Module 5 - Artefacts	Compulsory Quiz 3 due 17 Sep 2023, 11:59 PM
	18 - 24 September	Mid-break	
	25 September - 1 October	Mid-break	
9	02 - 8 October	Module 6 - Doppler Ultrasound and Doppler Artefacts	
10	09 - 15 October	Module 6 - Doppler Ultrasound and Doppler Artefacts	
11	16 - 22 October	Module 6 - Doppler Ultrasound and Doppler Artefacts	
12	23 - 29 October	Module 7 - Bioeffects and Safety	
13	30 October - 5 November	Module 7 - Bioeffects and Safety	Key Concept Presentation 2 due 05 Nov 2023, 11:59 PM
14	06 - 12 November	Module 8 - Equipment Performance and Quality Control	Key Points and Presentation Answers Portfolio. due 10 Nov 2023, 11:59 PM Compulsory Quiz 4 due 12 Nov 2023, 11:59 PM
15	13 - 19 November		
16	20 - 26 November		