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| **Course Credit:** | 1 Credit |
| **Time and Location:** | Thursday: Class NURS Rm 120 |
| **Instructor:** | Chelsie Wheatley, BSDMS, BSRS, RT(R), RDMS, RVT |
| **Phone:** | 208-241-1599 or 208-282-4042 (Secretary, Alyssa) |

**Overview:** This course will provide a fundamental presentation of topics that are important for students to master to become competent sonographers. It will provide a sufficient knowledge of the basics of sonography principles and instrumentation. Information in this course will be used to further sonographic practice and activities are structured to follow the guidelines of the ARDMS Sonography Principles and Instrumentation (SPI) Examination. This course includes the basic units, sound, describing sound waves, intensities, interaction of sound and media, range equation, transducers, sound beams, axial and lateral resolution, and display modes. Sonography Principles and Instrumentation II and III will enable the student to be prepared to sit for the SPI examination.

**Textbooks:** Edelman, Sidney K. “Understanding Ultrasound Physics”. 4th Ed. Woodlands, Tx: ESP Ultrasound, LLC; 2012. ISBN 0-962444-5-5

**Method of Presentation:**  Lecture, PowerPoint, Handouts, Moodle Supplement

**Code of Ethics:** DMS 4407 adheres to the ISU Code of Conduct.  In particular, academic dishonesty, however small, creates a breach in academic integrity.  A student's participation in this course comes with the expectation that his or her work will be completed in full observance of the ISU Code of Student Conduct.

**Course Learning Objectives/Goals:** This course has been designed to prepare student sonographers for the responsibilities of sonographic imaging. The student will learn the acoustic variables and parameters of sound waves, pulsed waves, basic units and relationships, parameters that describe both pulsed and continuous waves, considerations for sound beam intensities, and interaction of sound and media. They will learn range equation, different types of transducers and frequencies, and the shape and anatomy of a sound beam. Sound beam divergence, axial and lateral resolution, focusing, and A, B, and M-modes will be taught. At the conclusion of the course students will demonstrate understanding of units, acoustic parameters, anatomy of sound waves, intensities, attenuation and reflection, basic transducer frequencies, and sound beams. They will be able to describe axial and lateral resolutions as well as focusing. Ultimately, the student will gain a better understanding of the process involved in obtaining a technically adequate sonogram. This classroom understanding prepares the student for the clinical experience.

**Course Learning Outcomes:**

**Upon completion of this course, the student will be able to:**

* Identify units used in the metric system.
* Explain the definition of sound.
* Understand the three acoustic variables (Pressure, Density, Distance).
* Compare and contrast transverse waves vs. Longitudinal waves.
* Describe sound waves using the seven parameters.
* List the 3 bigness parameters.
* Explain the relationship between power and amplitude.
* Describe the wavelength equation.
* List the order of average speeds of sound in biologic tissues.
* Explain the “rule of thumbs”.
* Define Constructive and Destructive interference. J
* Define pulsed sound.
* List the five additional parameters that describe pulsed sound.
* Explain duty factor
* Understand parameters that describe both pulsed and continuous waves.
* Define intensity and the types of intensities.
* List the five key words relating to intensities.
* Explain the commandments of Intensity.
* Compare and contrast positive and negative decibels.
* Discuss attenuation in different media.
* Explain the types of scattering (Diffusion reflection/backscatter, Rayleigh scattering).
* Define the attenuation coefficient.
* Discuss the differences between the Intensity Reflection Coefficient and that Intensity Transmission Coefficient.
* Compare and contrast reflection and transmission with normal incidence and oblique incidence.
* Define refraction.
* Explain the 13 Microsecond rule
* Discuss basic transducers—the piezoelectric effect, basic transducer architecture, and frequencies.
* Identify bandwidth and quality factor.
* Explain the anatomy of a sound beam.
* Define Huygens’ Principle.
* Compare and contrast Axial and Lateral Resolution.
* Discuss why axial resolution is preferred to lateral resolution in ultrasound imaging.
* Explain focusing and the 3 ways it can alter the sound beam.
* List the differences between A-mode, B-mode, and M-mode.

**Academic Dishonesty Policy:**

Academic dishonesty (cheating, plagiarism, etc.) will not be tolerated in this class and may result in suspension or dismissal from this course and from the program. Cases will also be referred to the Dean of Students for possible dismissal from the university.

Cheating includes, but is not limited to, (1) use of any unauthorized assistance in taking quizzes, tests, or examinations; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or completing other assignments; or (3) the acquisition of tests or other academic materials belonging to the university faculty or staff without permission.

Plagiarism includes, but is not limited to, the use of, by paraphrase or direct quotation without correct recognition, the published or unpublished works of another person. The use of materials generated by agencies engaged in "selling" term papers is also plagiarism.

***When students submit their efforts for grading, they are attesting that they have abided by these rules.***

**Classroom Procedure:**

1.  **Attendance:**  You are expected to attend class regularly.  It is your responsibility to maintain a level of attendance which will allow you to derive maximum benefit from the instruction.  Excessive absences (>10%) will result in a lower course grade if you are borderline between two grades.  I expect you to arrive on time, with full attention. Do the work and interact with your peers and instructor.

2.  **Grading Procedure:**

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| **Assessment Method** | **Percentage Value** |
| Test #1 = Chapters 1-4 | 25% |
| Test #2 = Chapters 5-6 | 25% |
| Test #3 = Chapters 7-11 | 25% |
| Cumulative Final = Ch. 1-11  | 25% |
| Total | 100% |

**This grading Scale will be used:**

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| +/- System |  |
| 93-100% A | 73-76% C |
| 90-92% A- | 70-72% C- |
| 87-89% B+ | 67-69% D+ |
| 83-86% B | 63-66% D |
| 80-82% B- | 60-62% D- |
| 77-79% C+ | 59% Below F |

*Note: A grade of C or better is required in this course in order to receive a certificate from the Diagnostic Medical Sonography Program.*

Tests and Quizzes will be a combination of either written or computer based.  Students may use their own wireless laptops if they have one if tests are given in class; otherwise, students are required to use a lab computer when testing.

3. **Computer Account:** All students are required to have an ISU student computer account.  There is no fee for this account. Obtain the account at the Computer Center, which is located in the basement of the College of Business Building or in the Rendezvous Lab.

4.  **Make-up:** If you are unable to sit for an examination, you may request a make-up exam.  You must inform me that you will not be present for the examination **prior** to the scheduled time.  An additional 10% drop in the test grade will result if prior notification is not given and is not accepted by me prior to taking the test.  The highest grade you can receive for a make-up exam is 89% unless you provide me with an acceptable excuse. An acceptable excuse is defined **as very** sick; a death in the immediate family; some unforeseen circumstance that would prohibit you from taking the exam. The key is to communicate with me directly via email, phone, or in person. Do not speak to another faculty member or the department secretary. I’m very easy to catch with email, but make sure your email is received by me prior to the test deadline.

*In addition, it is a requirement to take all tests offered during the semester.  An incomplete will be issued for the class if a test is not taken.*

**Cell phone policy:** Cell phones should not be used in class. They should be place in silent or vibrating mode or turned off. Additionally receiving and retrieving text messages should not occur during class or in labs. Failure to follow this policy will result in a deduction of grade up to 10% at the discretion of the instructor. If you need to communicate to someone outside of the class in an emergency situation please inform the instructor so accommodations to this policy may be made.

**Disability Services:** Students with disabilities who wish to have accommodations provided by the University must self-identify with Disability Services (236-3599) in order to have accommodations provided. Information and applications are available in the Center and may be picked up in person or requested by telephone. The URL is <http://www.isu.edu/ada4isu/>