MASTER COURSE OUTLINE

A. DMSG 1405 Ultrasound Physics

B. COURSE DESCRIPTION:

This course will include the study of the basic principles and concepts of acoustical physics, which include the parameters of sound, and pulsed and continuous waves; the interaction of sound and media; the components of the ultrasound machine; the application of resolution and acoustic artifacts; ultrasound image optimization with consideration of patient exposure to acoustic energy; and emerging technologies and their use.
(3 Cr – 3 lect, 0 lab)

C. *Core Theme: Critical Thinking

D. RIVERLAND INSTITUTIONAL LEARNING OUTCOMES:

This course addresses the following Riverland Institutional Learning Outcome(s):
☒ ILO 1: critical thinking *(Core Theme Goal 2)*
☐ ILO 2: awareness of the larger global community *(Core Theme Goal 7 or 8)*
☐ ILO 3: ethical, engaged citizenship *(Core Theme Goal 9 or Goal 10)*
☐ ILO 4: communication and collaboration *(Discipline Goal 1 and by any learning outcome(s) involving communication or collaboration)*

E. MAJOR CONTENT AREAS:

- Basic math in ultrasound physics
- Sound waves - properties and principles
- Propagation of sound waves
- Piezoelectric properties and applications of ultrasound
- Ultrasound transducer and its components.
- Imaging modes
- Components of an ultrasonic imaging system
- Hemodynamics
- Principles of ultrasound Doppler
- Quality assurance and bioeffects

F. GOAL TYPE, OBJECTIVES, AND OUTCOMES:

GOAL TYPE	OBJECTIVES Students will be able to	OUTCOMES The student will successfully
*Critical Thinking	analyze the connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.	1. define the fundamental physics principles of the production and use of ultrasound.
CS	introduce the interaction of sound and media.	1. describe the properties and principles of sound waves. 2. differentiate between pulsed and continuous waves.
CS	introduce the components of an ultrasound machine.	1. discuss the components of an ultrasound machine. 2. list the parts and functions of an ultrasound machine.
CS	introduce principles of ultrasound doppler.	1. demonstrate use of ultrasound doppler. 2. optimize imaging.

G. SPECIAL INFORMATION:

This course may require use of the Internet, the submission of electronically prepared documents and the use of a course management software program. Students who have a disability and need accommodations should contact Accessibility Services at the beginning of the semester. This information will be made available in alternative format, such as Braille, large print, or current media, upon request.

H. COURSE CODING INFORMATION:

Course Code X/Class Maximum 20; Letter Grade

Revision date:
AASC Approval date: 11/18/25

*These five MnTC Goals have been identified as Riverland Community College Core Themes. Every course in the Riverland Community College curriculum shall meet outcomes from one of these themes.
**These five MnTC Goals have been identified as Riverland Community College Disciplines. Riverland's MnTC courses also shall meet outcomes from a Discipline Area.

NOTE: The Minnesota Transfer Curriculum "10 Goal Areas of Emphasis" are reflected in the five required discipline areas and five core themes noted in the Riverland Community College program of study guide and/or college catalog.

*Riverland Community College Core Themes	MnTC Goal Number
Critical Thinking (CT)	**2**
Human Diversity (HD)	**7A, 7B, 7A/B**
Global Perspective (GP)	**8**
Ethical and Civic Responsibility (EC)	**9**
People and the Environment (PE)	**10**

**Riverland Community College Discipline Areas	MnTC Goal Number
Communication (CM)	**1**
Natural Sciences (NS)	**3**
Mathematics/Logical Reasoning (MA)	**4**
History and the Social & Behavioral Sciences (SS)	**5**
Humanities and Fine Arts (HU)	**6**