SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number:	DMDS 100	Department:	Diagnostic Med. Sonography

Course Title: Physics & Instrumentation 1 Semester: Spring Year: 1997

Objectives/Competencies

Course Objective	Competencies
1. Sound/Ultrasound	1. Define sound and ultrasound and describe the differences.
	2. Describe the relationship between sound and ultrasound
	and the electromagnetic spectrum.
	3. Describe the range of sound and ultrasound frequencies.
	4. Recognize the common frequencies used in sonography and their uses.
	5. Define acoustic variable and describe how each relate to
	Diagnostic Medical Sonography.
	6. Define velocity and describe the factors that determine it.
	7. Define and calculate amplitude, wavelength, period and frequency.
	8. Describe the relationship between velocity, frequency and wavelength.
	9. Describe the relationship between frequency and penetration.
	10. Describe and recognize interaction of sound with tissue.
	11. Using a sound meter, locate and measure the effects of
	interface.
	12. Define and calculate the intensity reflection coefficient.

Course Number: DMDS 100 Page 2

Course Objective	Competencies	
2. Piezoelectric Effects/Transducers	13. Define and calculate the intensity transmission coefficient. 14. Define and determine the angle of incidence and reflection. 15. Define intensity and describe its measurement. 16. Define duty factor and relate to the safe use of ultrasound. 17. Use an oscilloscope to measure typical voltages related to the production and detection of sound and ultrasound. 18. Define and calculate echo ranging. 1. Define and explain piezoelectric and reverse PE effects. 2. Describe how piezoelectric and reverse effects are used to create and detect sound in sonography. 3. Define resonance and describe its relationship to sound production and detection. 4. Diagram a typical ultrasound transducer and label and explain the purpose of each component. 5. Describe the factors that determine TD frequency. 6. List, describe and be able to identify various TD types. 7. Describe and exercise proper care and maintenance of transducers, including sterilization techniques. 8. Explain factors that determine TD sensitivity. 9. Describe and determine TD created exposure fields.	
3. Signal Production/Reception/Display	10. Define axial and lateral resolution and explain determinants.11. Using lab equipment, measure axial and lateral resolution.	

Course Number: DMDS 100 Page 3

Course Objective	Competencies
4. Computer Technology/Signal Processing	 Explain equipment related to the signal production process. Describe the signal reception process. Explain amplification and describe its application. Explain filtering and describe its application. Outline the RF to single voltage process. Explain the various methods of signal detection. Draw, label and explain the various components of a CRT. Describe and adhere to all safety precautions related to CRT's and related CRT devices. Explain creation and purpose of A, B & M-mode. Explain dynamic range and importance to DMS. Define "noise" and list various methods of cause and control.
5. Use of Typical Controls/Instrumentation Types	 Define "analog" and "digital" and application. Recognize analog versus digital signals. Describe what an A/DC and a D/AC does and relate use. Define bit, byte, kilobyte, megabyte, CPU, memory, storage, input, output, processing and pixel. Define and explain software. Develop and ally a basic algorithm. List and explain preprocessing and postprocessing methods. List and explain the use of the various controls used for signal manipulation to include: amplification, filters (electronic and mechanical) reject, power, focusing, and

Course Objective	Competencies
6.	processing. 2. Provide lab equipment and test objects, use typical signal manipulation controls to produce "zero defect" images.
	 Diagram, label and explain the components of a static nit. Diagram, label and explain the components of a typical mechanical realtime unit. Diagram, label and explain the components of a typical phased array realtime unit.