Diagnostic Medical Sonography

Overview

The CRC Diagnostic Medical Sonography (DMS) Program includes didactic, laboratory, and practicum components that are structured to facilitate the achievement of educational and career goals. According to the American Registry for Diagnostic Medical Sonographers (ARDMS), sonographers are “highly-skilled professionals who use specialized equipment to create images of structures inside the human body that are used by physicians to make medical diagnoses.”

Organizations such as the American Registry of Diagnostic Medical Sonographers (ARDMS) certify the competency of sonographers through registration.

Program Maps

Diagnostic Medical Sonography, A.S. Degree (/crc/main/doc/programs/program-maps/dms-as-degree-ho.pdf)

Associate Degree

A.S. in Diagnostic Medical Sonography

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Organizations such as the American Registry of Diagnostic Medical Sonographers (ARDMS) certify the competency of sonographers through registration.
Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
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<tbody>
<tr>
<td>1st Summer Semester:</td>
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<tr>
<td>SONOG 200</td>
<td>Introduction to Sonography</td>
<td>3</td>
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<tr>
<td>SONOG 202</td>
<td>Sectional Anatomy for Medical Imaging</td>
<td>3</td>
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<tr>
<td>1st Fall Semester:</td>
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<tr>
<td>SONOG 205</td>
<td>Ultrasound Physics &amp; Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>SONOG 210</td>
<td>Abdominal Scanning and Pathology</td>
<td>4</td>
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<tr>
<td>SONOG 240</td>
<td>Superficial &amp; Small Parts Scanning</td>
<td>3</td>
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<td>1st Spring Semester:</td>
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</tr>
<tr>
<td>SONOG 215</td>
<td>Clinical Experience I</td>
<td>7</td>
</tr>
<tr>
<td>SONOG 220</td>
<td>OB/GYN Scanning &amp; Pathology</td>
<td>4</td>
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<tr>
<td>2nd Summer Semester:</td>
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<tr>
<td>SONOG 225</td>
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<tr>
<td>SONOG 228</td>
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<tr>
<td>SONOG 230</td>
<td>Vascular Scanning</td>
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<td>SONOG 235</td>
<td>Clinical Experience III</td>
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<td>2nd Spring Semester:</td>
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<tr>
<td>SONOG 250</td>
<td>Sonography Interpretation &amp; ARDMS/ARRT Exam Review</td>
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<td>SONOG 255</td>
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<td>Total Units:</td>
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The Diagnostic Medical Sonography Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

Enrollment Eligibility

To be eligible for enrollment in the program, the student must meet the following criteria:

- Associate in Science degree, or higher, from a U.S. accredited college;
- A minimum of 800 hours of paid or volunteer patient care experience; hours must be documented within an official volunteer program where they report to a licensed/credentialed health care provider; home health care for a single patient is not acceptable. Applicants will need to document their 800 hours either volunteer, student extern/intern hours, or work hours in direct patient care;
- Complete the application process for enrollment in the DMS program;
- Fulfill all requirements set forth by the CRC Allied Health Practicum Guidelines including but not limited to: background clearance, physical examination, CPR Certification, immunization clearance and drug screening;
- Successfully complete with a B or better all prerequisite courses as outlined below.
  - College-level Intermediate Algebra (or higher math course)
  - Interpersonal Communications (or equivalent communications/speech course)
  - Anatomy & Physiology (one year with lab)
  - Medical Language
  - Human Disease or Pathophysiology
  - Conceptual Physics
- The program prerequisites do not apply to physicians who have an approved foreign transcript evaluation.

Student Learning Outcomes

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

- Perform entry-level skills of a diagnostic sonographer in a clinical setting (PSLO #1);
- Successfully complete the American Registry of Diagnostic Medical Sonographers (ARDMS) certification examination (PSLO #2);
- Acknowledge and adhere to the scope of practice of a Diagnostic Medical Sonographer (PSLO #3).

Career Information

Career Opportunities: According to the ARDMS, Sonography is a dynamic profession that has grown significantly over the past 25 years. With rapidly developing new technologies and increased use of diagnostic ultrasound procedures, growth is projected to continue in the future with employment opportunities for qualified sonographers in both urban and rural areas nationwide. Sonographers and vascular technologists can choose to work in clinics, hospitals, private-practice physician offices, public-health facilities, laboratories, and other medical settings performing examinations in their areas of specialization. According to the Bureau of Labor Statistics' Occupational Outlook Website, almost two-thirds of all sonographers are employed by hospitals. The rest work in physicians' offices, medical and diagnostic laboratories/imaging centers and outpatient care centers. Employment of diagnostic medical sonographers is expected to increase by 29.4 percent, or 1,500 jobs between 2014 and 2024. As ultrasound technology evolves, it will become a more common method used to assist in diagnosing medical conditions, favored over more invasive procedures.
Certificate of Achievement

Diagnostic Medical Sonography Certificate

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Students must achieve a “C” or better in all SONOG didactic courses and a “Pass” in all practicum courses to remain in, and progress through, the DMS program. Students who do not achieve these minimum expectations will be dismissed from the program.

Organizations such as the American Registry of Diagnostic Medical Sonographers (ARDMS) certify the competency of sonographers through registration.

Catalog Date: June 1, 2020

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- Complete the application process for enrollment in the DMS program;
- Fulfill all requirements set forth by the CRC Allied Health Practicum Guidelines including but not limited to: background clearance, physical examination, CPR Certification, immunization clearance and drug screening;
- Successfully complete with a B or better all pre-requisite courses as outlined below within the last five (5) years:
  - College-level Intermediate Algebra (or higher math course)
  - Interpersonal Communications (or equivalent communications/speech course)
  - Anatomy & Physiology (one year with lab)
  - Medical Language
  - Human Disease or Pathophysiology
  - Conceptual Physics
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Career Information

Career Opportunities: According to the ARDMS, Sonography is a dynamic profession that has grown significantly over the past 25 years. With rapidly developing new technologies and increased use of diagnostic ultrasound procedures, growth is projected to continue in the future with employment opportunities for qualified sonographers in both urban and rural areas.
Diagnostic Medical Sonography (SONOG) Courses

SONOG 200 Introduction to Sonography

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

- Identify safety issues involved in the field of sonography - SLO #1
- Demonstrate correct ergonomic techniques while performing various scanning tests.
- Discuss legal and bioethical situations inherent in the field of medicine, as well as specific to the sonography occupation.
- Relate various techniques to ensure patient safety during scanning tests.
- Discuss the field of sonography including the role of the sonographer in the healthcare team - SLO #2
- Use correct sonography terminology, including spelling and pronunciation.
- Relate the relationship between the sonographer and other various healthcare team members e.g. physicians, radiologists and patients.
- Determine if the field of sonography is the correct occupational choice.
- Identify scope of practice parameters for the sonographer
- Identify basic patient care techniques, including scanning, assessments and treatments - SLO #3
- Display professionalism and cultural awareness when working with diverse patient populations.
- Choose proper scanning techniques given specific patient parameters.

SONOG 202 Sectional Anatomy for Medical Imaging

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

- SLO 1: Explain the basic cross-sectional planes by defining and identifying 3D anatomy from 2D images, comparing structures to multiple imaging modalities
- Demonstrate knowledge of basic directional imaging terminology
- Apply knowledge of a single plane image to describe multiple plane anatomical structures
- Illustrate and identify structures and organs with labels in cross-sectional planes from diagnostic images
- Compare and contrast the differences of the same organ planes on CT, MRI and sonographic images
- Demonstrate spatial relationship skills using drawings to explain relationships to different sonographic planes
- SLO 2: Demonstrate a fundamental understanding of cross-sectional anatomic planes compared to normal variations
- Describe structures in anatomical terms specifically used in medical imaging and diagnostic medical sonography
- Compare and contrast positive and negative uses of anatomical structures demonstrated on CT and MRI vs sonographic images
- Explain the proper protocols and use of sonographic images compared to other imaging modalities
assess the impact of anatomical pathologies and how it effects adjacent normal organs

- SLO 3: IDENTIFY ANATOMICAL STRUCTURES WITHIN ORGANS AND IN RELATIONSHIP TO SURROUNDING ORGANS
- utilize proper sonographic terms to describe cross sectional images
- demonstrate the ability to verbally explain and critique anatomy on images
- compare CT and MRI images to sonographic images for sectional anatomy of major organs
- integrate in-class experiences to apply knowledge of specific cross sectional images in human anatomy
- SLO 4: DETERMINE GENERAL EFFECT OF LAYERING ANATOMY BASED ON ANATOMICAL OBSERVATIONS
- analyze structural distinctions and apply concepts of oblique images and orthogonal planes
- determine adjacent structures from a single plane and analyze for reconstruction to describe the 3D organ

SONOG 205 Ultrasound Physics & Instrumentation

Units: 3
Hours: 54 hours LEC
Prerequisite: SONOG 202 with a grade of "C" or better
Corequisite: SONOG 210 and 240
Enrollment Limitation: This course is only available to students who have been accepted into the most recent cohort and who remain in good standing within the DMS program.
Catalog Date: June 1, 2020

This course covers the basic principles of diagnostic ultrasound physics and instrumentation. Topics include acoustical physics, Doppler effect, color flow imaging and the effects of ultrasound waves on human tissue. The course will cover transducer designs, quality assurance, bio-effects and imaging artifacts. The fundamentals of instrumentation, equipment design and application will be included. Hands-on instruction may be provided to introduce the student to necessary elementary scanning skills. This course is available to students who have been accepted in to the DMS program. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.

Student Learning Outcomes

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

- ASSESS THE EFFECTS OF ULTRASOUND WAVES ON HUMAN TISSUE - SLO #1
- Explain the Doppler Effect and how it is used in the assessment of blood flow velocity in both continuous and pulsed wave Doppler.
- Determine the effects of acoustic waves on tissue and its application to organ structural analysis.
- EVALUATE THE QUALITY OF AN ULTRASOUND SCAN TO ENSURE ACCURATE RESULTS - SLO #2
- Employ quality assurance measures while working with ultrasound equipment to decrease the risk of imaging artifacts.
- Determine how the various transducer designs that are currently available relate to quality assurance.
- Identify processes the sonographer can employ to decrease the biological effects on tissue while performing scans.
- DISCUSS THE FUNDAMENTALS OF ULTRASOUND EQUIPMENT - SLO #3
- Compare and contrast the various sonography equipment designs currently available.
- Demonstrate correct usage of basic sonography instrumentation.
- Assess the various applications of sonography in healthcare.

SONOG 210 Abdominal Scanning and Pathology

Units: 4
Hours: 36 hours LEC; 108 hours LAB
Prerequisite: SONOG 202 with a grade of "C" or better
Corequisite: SONOG 205 and 240
Enrollment Limitation: This course is only available to students who have been accepted into the most recent cohort and who remain in good standing within the DMS program.
Catalog Date: June 1, 2020

This course will provide a study of the clinical applications of abdominal sonography, including positioning and scanning protocol. Anatomical structures will include: abdominal vasculature; liver; gallbladder and biliary system; pancreas; spleen; and kidneys. Specific pathology and clinical symptomatology will be covered as they relate to the sonographic appearance of these structures. Interpretation and critique of normal and abnormal anatomy with correlation of clinical, didactic and image information will be presented. This course is available to students who have been accepted in to the DMS program. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.

Student Learning Outcomes

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

- EVALUATE ABDOMINAL SCANS IN ORDER TO ASSESS NORMAL AND ABNORMAL STRUCTURES - SLO #1
- Identify relevant abdominal structures as to their shape, location and size on a scan.
- Compare scanned images for normal and abnormal abdominal structures.
- RELATE CLINICAL SYMPTOMATOLOGY TO POTENTIAL ABDOMINAL ABNORMALITIES - SLO #2
- Determine which abdominal structures to scan based on patient symptoms and clinical history.
- Demonstrate correct scanning technique for specific abdominal conditions and ordered tests, including patient positioning.
This course will provide basic instruction and scanning experience in sonography in a hospital or other healthcare setting. The student will learn to demonstrate the ability to perform basic sonographic examinations according to the protocols established by the program and healthcare facility utilizing sonographic equipment. The directed practice experience will serve to familiarize the student with the hospital setting, sonography department and other related clinical training aspects including Health Insurance Portability and Accountability Act (HIPAA) law. This course is only available to students who currently enrolled in the DMS program and have met the pre-requisites, co-requisites and have met all enrollment limitations. This course is graded as “Pass/No Pass”, and students must achieve a “Pass” to remain in the DMS program.

Student Learning Outcomes

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

- APPLY SCANNING THEORY AND PRACTICAL SKILLS IN A HEALTHCARE SETTING - SLO #1
- Perform scans under the supervision of a licensed sonographer in a hospital or other healthcare setting.
- Demonstrate proper patient positioning, moving and lifting techniques with concern for patient safety and modesty during scanning procedures.
- Maintain an ongoing record of cases participated in or observed during clinical rotation.
- DEMONSTRATE PROPER PROFESSIONAL BEHAVIOR IN THE CLINICAL SETTING - SLO #2
- Relate HIPAA regulations as they relate to sonography.
- Adhere to the Diagnostic Medical Sonographer scope of practice.
- Adhere to the program protocol and hospital policies set forth prior to clinical rotations with respect to professional and ethical behavior.

SONOG 220 OB/GYN Scanning & Pathology

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

- IDENTIFY FEMALE REPRODUCTIVE AND FETAL STRUCTURES ON A SONOGRAPHIC IMAGE - SLO #1
- Assess fetal gestational age, fetal anatomy, placenta, umbilical cord, and amniotic fluid on a scanned image.
- DEMONSTRATE CORRECT OB/GYN SCANNING TECHNIQUES - SLO #2
- Determine appropriate technique including patient positioning based on maternal and/or fetal conditions, pathological processes and protocols.
- Compare transabdominal and transvaginal preparation and scanning and determine appropriateness of each.
- Relate clinical symptomotology to potential OB/GYN abnormalities and choose appropriate scanning technique

SONOG 225 Clinical Experience II

This course will provide intermediate-level instruction and scanning experience in a hospital or other healthcare setting. The student will be able to demonstrate the ability to perform abdominal, OB/GYN and small parts sonographic examinations of patients according to the protocols established by the program and healthcare facility utilizing sonographic equipment. This course is available to students who have been accepted in to the most recent DMS cohort. This course is graded “Pass/No Pass”, and students must achieve a “Pass” to remain in the DMS program.
Upon completion of this course, the student will be able to:

- **APPLY SONOGRAPHY THEORY AND PRACTICAL SKILLS IN A HEALTHCARE SETTING - SLO #1**
- Perform intermediate-level scans under the supervision of a licensed sonographer in a hospital or other healthcare setting.
- Demonstrate proper patient positioning, moving and lifting techniques with concern for patient safety and modesty during scanning procedures.
- Maintain an ongoing record of cases participated in or observed during clinical rotation.
- **DEMONSTRATE PROPER PROFESSIONAL BEHAVIOR IN THE CLINICAL SETTING - SLO #2**
- Describe HIPAA regulations as they relate to sonography.
- Adhere to the Diagnostic Medical Sonographer scope of practice.
- Adhere to the program protocol and hospital policies set forth prior to clinical rotations with respect to professional and ethical behavior.

### SONOG 228 Advanced OB/GYN Pathology

**Units:** 2  
**Hours:** 36 hours LEC  
**Prerequisite:** SONOG 220 with a grade of "C" or better  
**Enrollment Limitation:** This course is only available to students who have been accepted into the most recent cohort and who remain in good standing within the DMS program. Students must take this course for a letter grade, and must earn a grade of "C" or better in this course to remain in the DMS program.  
**Catalog Date:** June 1, 2020

This course builds upon lessons from SONOG 220 covering OB/GYN pathology and maternal-fetal complications. This course covers: High Risk Obstetrics in Sonography, Fetal Structural Abnormalities, Genetic Abnormalities and Syndromes. This course will also cover clinical assessments including interventional procedures and post-partum complications as well as pathology involving infertility. Topics of discussion include related clinical symptoms, sonographic appearances, scanning techniques and protocols. This course is available to students who have been accepted in to the most recent DMS cohort. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.

### Student Learning Outcomes

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

- **IDENTIFY ABNORMAL FEMALE REPRODUCTIVE AND FETAL ANOMALIES ON SONOGRAPHIC IMAGES - SLO #1**
- Locate relevant normal structures and identify abnormal structures of the female reproductive system in both pregnant and non-pregnant patients.
- Assess fetal gestational age to determine abnormal growth patterns including IUGR, fetal anomalies, placental defects and anomalies. Associated umbilical cord, amniotic fluid assessments and biophysical profiles associated with anomalies and sequential amniotic fluid assessment in the high risk pregnancy.
- **DEMONSTRATE FETAL ANOMALIES AND GYNECOLOGIC DISEASES USING CLINICAL ASSESSMENT TOOLS. SLO #2**
- **ANALYZE AND SYNTHESIZE MULTIPLE SOURCES OF INFORMATION TO ENSURE ALL REQUIRED IMAGES OF ABNORMALITIES ARE RECORDED AND INCLUDED IN THE TECHNICAL IMPRESSION. SLO#3**
- Determine appropriate technique including patient positioning based on maternal and/or fetal conditions, pathological processes and protocols.
- Compare transabdominal and transvaginal preparation and scanning and determine appropriateness of each.
- Relate clinical symptomatology to potential OB/GYN abnormalities and choose appropriate scanning technique making proper adjustments during the examination.

### SONOG 230 Vascular Scanning

**Units:** 4  
**Hours:** 36 hours LEC; 108 hours LAB  
**Prerequisite:** SONOG 225 with a grade of "C" or better  
**Corequisite:** SONOG 235  
**Enrollment Limitation:** This course is only available to students who have been accepted into the most recent cohort and who remain in good standing within the DMS program. Students must take this course for a letter grade, and must earn a grade of "C" or better in this course to remain in the DMS program.  
**Catalog Date:** June 1, 2020

This course covers the basic positioning and scanning protocol of the vascular system. Terminology specific to the hemodynamics of the arterial, venous and cerebrovascular applications will be presented. Normal, abnormal and pathologic states of the vascular system, including the carotid and lower extremities, will be included. This course is available to students who have been accepted in to the most recent DMS cohort. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.

### Student Learning Outcomes

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

- **EVALUATE VASCULAR SCANS TO ASSESS NORMAL AND ABNORMAL STRUCTURES AND VASCULAR FLOW - SLO #1**
- Identify relevant vascular structures of the neck, pelvis, abdominal cavity and extremities.
- Compare vascular scanned images for normal and abnormal vascular flow and/or structural abnormalities.
- **RELATE SYMPTOMATOLOGY TO POTENTIAL ABNORMALITIES AND/OR PATHOLOGY OF THE VASCULAR SYSTEM - SLO #2**
- Demonstrate correct non-invasive vascular scanning technique, including patient positioning.
- Demonstrate knowledge of signals produced by arterial blood flow in both visual and auditory presentation.
- Determine the specific vascular area and/or structures to scan based on patient clinical history.

### SONOG 235 Clinical Experience III
This course will provide intermediate/advanced-level instruction, supervision and scanning experience in a hospital or other healthcare setting. The student will be able to demonstrate the ability to perform abdominal, OB/GYN, vascular, superficial and/or small parts scans under the supervision of a licensed sonographer in a hospital or other healthcare setting. This course is available to students who have been accepted into the most recent DMS cohort. This course must be taken for a letter grade, and students must achieve a "Pass" to remain in the DMS program.

Student Learning Outcomes

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

- APPLY SCANNING THEORY AND PRACTICAL SKILLS IN A HEALTHCARE SETTING - SLO #1
  - Perform abdominal, OB/GYN, vascular, superficial and/or small parts scans under the supervision of a licensed sonographer in a hospital or other healthcare setting.
  - Demonstrate proper patient positioning, moving and lifting techniques with concern for patient safety and modesty during scanning procedures.
  - Maintain an ongoing record of cases participated in or observed during clinical rotations.
- DEMONSTRATE PROPER PROFESSIONAL BEHAVIOR IN THE CLINICAL SETTING - SLO #2
  - Relate HIPAA regulations as they relate to scanning.
  - Adhere to the Diagnostic Medical Sonographer scope of practice.
  - Adhere to the program protocols and hospital policies set forth prior to clinical rotations with respect to professional and ethical behavior.

SONOG 240 Superficial & Small Parts Scanning

This course covers the basic positioning and scanning of pediatric, small part and superficial structures; related anatomy and pathology; clinical symptomatology and how they relate to the sonographic appearance. Interpretation of normal and abnormal anatomy with correlation of clinical information will also be presented. This course is available to students who have been accepted in to the most recent DMS cohort. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.

Student Learning Outcomes

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

- EVALUATE SUPERFICIAL STRUCTURE SCANS TO ASSESS NORMAL AND ABNORMAL ANATOMY - SLO #1
  - Identify relevant superficial and small part structures as to their shape, location and size to include the extremities, digits, testes, thyroid and neck.
  - Compare scanned images for normal and abnormal superficial and small part structures.
- RELATE CLINICAL SYMPTOMATOLOGY TO POTENTIAL ABNORMALITIES AND/OR PATHOLOGY - SLO #2
  - Demonstrate correct scanning technique of superficial or small part structures, including patient positioning.
  - Determine the specific structure or area to scan based on patient symptoms and clinical history.
- EVALUATE PEDIATRIC SCANS TO ASSESS NORMAL AND ABNORMAL ANATOMY - SLO #3
  - Demonstrate correct scanning technique of pediatric patients, including positioning.
  - Determine the specific structure or area to scan based on patient symptoms and clinical history.
  - Compare scanned images for normal and abnormal pediatric structures.

SONOG 250 Sonography Interpretation & ARDMS/ARRT Exam Review

This course will cover advanced interpretation and critique of abdominal, OB/GYN, vascular, superficial and small parts sonographs. This course serves as a continuation of previous, basic knowledge within the Diagnostic Medical Sonography program. This course will also provide students with guidance to assist them in their independent study and preparation for the ARDMS and AART examinations. This course is available to students who have been accepted in to the most recent DMS cohort. This course must be taken for a letter grade, and students must achieve a "C" or better to remain in the DMS program.
Upon completion of this course, the student will be able to:

- CRITIQUE AND INTERPRET NORMAL AND ABNORMAL SONOGRAPHIC IMAGES - SLO #1
- Analyze scanned images to interpret results as either normal or abnormal, to include the following areas: abdominopelvic cavity, OB/GYN, vascular, superficial and small parts structures.
- Critique scanned images for quality and accuracy based on patient clinical history.

SONOG 255 Clinical Experience IV

This course is the final directed practice study course in the Diagnostic Medical Sonography program. The course incorporates all areas of study including the abdomen, OB/GYN, vascular, superficial and small parts scanning. The student will be able to perform advanced sonographic examinations in a healthcare facility according to the protocols and criteria established by the CRC DMS program. Students will complete all final program competency evaluations and demonstrate the ability to perform all required examinations, including the ability to scan independently, under the direction of the assigned primary clinical site preceptor(s). This course is graded “Pass/No Pass”, and students must achieve a "Pass" to remain in the DMS program.

Student Learning Outcomes

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

- APPLY PREVIOUSLY LEARNED MATERIAL IN THE PERFORMANCE OF PATIENT ULTRASOUND EXAMINATIONS - SLO #1
- Utilize content knowledge and practical skills learned from previous sonography courses.
- Perform advanced sonographic examinations in the following areas: abdominopelvic, vascular, OB/GYN, superficial and small parts.
- DEMONSTRATE PROPER PROFESSIONAL BEHAVIOR IN THE CLINICAL SETTING - SLO #2
- Adhere to the Diagnostic Medical Sonographer scope of practice.
- Adhere to the CRC DMS program protocol and clinical facility policy set forth prior to clinical rotations.