DMS-500: FUNDAMENTALS OF DIAGNOSTIC MEDICAL SONOGRAPHY (FORMERLY DMS-100)

Effective Term
Fall 2026

BOT Approval Date
01/15/2026

Discipline
DMS - Diagnostic Medical Sonography
Course Number
500

Course Title
Fundamentals of Diagnostic Medical Sonography (formerly DMS-100)

Short Title
Fundamentals of DMS

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lecture Units
1.50

Lab Units
1.50

Total Units
3.00

Hours

Lecture Contact Hours
24-27
Out of Class Hours Lecture
48-54

Lab Contact Hours
72-81
Out of Class Hours Lab
0.00

Total Contact Hours
96 - 108

Total Out of Class Hours
48 - 54

Total Student Learning Hours
144 - 162

Is this an existing Extensive Lab?
No

Do you want to propose this for Extensive Lab?

No

Distance Education

No

Catalog Description

This course introduces students accepted into the Diagnostic Medical Sonography (DMS) program to foundational skills in ultrasound scanning. Emphasis is placed on abdominal and pelvic protocols, with introductory exposure to small parts, obstetric/gynecologic, and vascular examinations. Students learn sonographic terminology, anatomical planes, gray scale imaging principles, and the use of color and pulsed-wave Doppler as integral tools across scanning categories. Through lecture, lab practice, and simulation, students develop technical precision, image documentation skills, professional communication, and inclusive patient-centered care. (formerly DMS-100)

Requisites

Prerequisite(s)

Prerequisite(s) (must be taken before)
Acceptance into the Diagnostic Medical Sonography Program.

Codes

TOP Code (CB 03)

1227.00* - *Diagnostic Medical Sonography

CIP Code

51.0910 - Diagnostic Medical Sonography/Sonographer and Ultrasound Technician.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Diagnostic Medical Technology	End

Learning Objectives

Learning Objectives

Learning Objective
1. Identify sonographic terminology, anatomical landmarks, and scanning planes for abdominal, pelvic, obstetric/gynecologic, vascular, and small parts imaging.
2. Apply fundamental sonographic principles, including gray scale optimization and introductory Color and Pulsed-Wave Doppler, to produce diagnostic-quality images.
3. Analyze patient positioning, ergonomics, and scanning techniques to determine their impact on image quality and sonographer safety.
4. Evaluate normal sonographic appearances of abdominal and pelvic anatomy to establish baseline criteria for distinguishing pathology.
5. Create connections between lecture concepts and hands-on scanning practice by reflecting on lab performance and adapting techniques for improvement.
6. Develop culturally responsive communication and inclusive scanning approaches to ensure equitable patient care across diverse populations.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will produce complete abdominal and pelvic sonographic examinations that include a full set of diagnostic images, properly labeled and archived for evaluation of technical accuracy and inclusive patient care.
2. Students will demonstrate introductory sonographic examinations of small parts, obstetric/gynecologic, and vascular structures by generating image documentation that meets baseline protocol requirements.
3. Students will analyze gray scale and Doppler imaging principles by adjusting machine parameters in real time and submitting annotated images that show optimization across diverse patient presentations.
4. Students will evaluate and document sonographic images by submitting written image critiques and protocol-based reports that confirm accuracy, compliance, and patient-centered practice.
5. Students will create a protocol reference by compiling a personalized pocketbook that includes labeled diagrams, protocol steps, and documentation standards, submitted for grading as a complete portfolio.

Content

Course Lecture Content

1. Foundations of Sonography
   a. Terminology and planes
   b. Gray scale and introductory Doppler principles
   c. Equipment orientation and controls
2. Abdominal Imaging
   a. Aorta and IVC
   b. Liver with Doppler
   c. Gallbladder and biliary system
   d. Kidneys and bladder with Doppler
   e. Pancreas and spleen with Doppler
3. Pelvic and Obstetric Imaging
   a. Uterus and ovaries with Doppler
   b. First trimester OB (TA and TV simulation)
   c. Second/third trimester OB
   d. Pelvic protocol development
4. Small Parts Imaging
   a. Thyroid with Doppler
   b. Scrotum phatom
   c. Breast phantom
5. Vascular Imaging
   a. Carotid duplex
   b. Lower extremity venous duplex
   c. Lower extremity arterial duplex
6. Professional Foundations
   a. Protocol pocketbook development
   b. Midterm abdominal practicum
   c. Final pelvic practicum
   d. Inclusive patient-centered care, such as adapting positioning for patients with limited mobility, adjusting techniques for higher BMI, and using culturally responsive communication

Course Lab Content

1. Utilizing the scan lab
   a. Orientation to the scan lab
      i. Ultrasound machine
      ii. Ultrasound transducers
      iii. Phantoms
      iv. Simulators
   b. Scan lab maintenance

i. Proper equipment handling
ii. Cleaning and disinfection procedures

2. Patient Scenarios
   a. Age-related considerations
   b. Gender-related considerations
   c. Ethnicity-related considerations
   d. Disability-related considerations
      i. Physical
      ii. Mental
      iii. Emotional
3. Ultrasound machine usage
   a. Knobology
      i. Depth
      ii. Gain
      iii. TGC
      iv. Focus
      v. Frequency
   b. Imaging modes
      i. B-mode
      ii. Color Doppler mode
      iii. Pulsed-wave Doppler mode
      iv. M-mode
      v. Continuous wave mode
      vi. Harmonics
      vii. 3D imaging
4. Imaging Protocols
   a. Abdomen complete
      i. Aorta and IVC
      ii. Liver
      iii. Gallbladder and biliary tree
      iv. Kidneys and bladder
      v. Pancreas
      vi. Spleen
   b. Small parts
      i. Thyroid
      ii. Scrotum
      iii. Breast
   c. Female pelvis
      i. Uterus
      ii. Ovaries
      iii. Adnexa
   d. First trimester obstetrical
      i. Gestational sac
      ii. Yolk sac
      iii. Fetal pole
      iv. Fetal heart tone
   e. Second and third trimester obstetrical
      i. Maternal anatomy
         1. Cervix
         2. Lower uterine segment
      ii. Fetal position
      iii. Placental position
      iv. Fetal heart tone
      v. Biometrics
         1. Biparietal diameter
         2. Head circumference

3. Abdomen circumference
4. Femur length

vi. Amniotic fluid

f. Carotid artery
   i. Common carotid artery
   ii. External carotid artery
   iii. Internal carotid artery
   iv. Vertebral artery

g. Lower extremity venous
   i. Common femoral vein
   ii. Profunda femoris vein
   iii. Femoral vein
   iv. Popliteal vein
   v. Posterior tibial veins
   vi. Peroneal veins
   vii. Greater saphenous vein

h. Lower extremity arterial
   i. Common femoral artery
   ii. Profunda femoris artery
   iii. Superficial femoral artery
   iv. Popliteal artery
   v. Anterior tibial artery
   vi. Posterior tibial artery
   vii. Peroneal artery
   viii. Dorsalis pedis artery

Methods of Instruction

Method

Lecture

Integration

Lectures, including slide decks and verbal explanations, will introduce foundational concepts in sonography, including terminology, scanning planes, image optimization, and Doppler principles. Lectures will also incorporate visual aids such as diagrams and accessible, captioned videos of sonographic procedures. Questions will be encouraged throughout to maintain engagement, clarify concepts, and connect theory to lab applications.

Method

Observation and Demonstration

Integration

Demonstrations will model correct scanning techniques using ultrasound machines, models, and phantoms. These demonstrations will emphasize ergonomics, probe placement, gray scale optimization, and Doppler applications. Students will observe, take notes, and ask questions before practicing independently with instructor guidance.

Method

Lab Activities

Integration

Lab activities will provide structured opportunities for students to practice scanning protocols on peers, models, and phantoms. Instructors will circulate to provide real-time feedback on technical accuracy and patient-centered communication. Students will rotate roles as sonographer and patient to better understand both technical and interpersonal aspects of scanning.

Method

Role Playing/Simulation

Integration

Role playing and simulation will reinforce lecture content and lab practice by engaging students in case-based scenarios and simulated patient encounters. Students will analyze clinical histories, select protocols, and perform simulated exams that integrate anatomy, Doppler, and image documentation. These activities will also include attention to culturally responsive communication and inclusive patient care.

Method

In-class Exercises

Integration

In-class exercises will include short, structured activities during lecture and lab, such as labeling anatomy on diagrams, optimizing preset images, or identifying correct probe positions. These exercises will provide immediate practice and allow for quick instructor feedback.

Method

Group Projects

Integration

Group projects will encourage collaborative learning, where students work in pairs or small groups to complete scanning tasks, review protocols, and provide peer feedback. Group work will foster teamwork, reinforce communication skills, and promote constructive critique of scanning techniques and inclusive, patient-centered care.

Method

Individual Projects

Integration

Individual projects will guide students in creating their Protocol Pocketbook. Each student will independently document scanning protocols, including diagrams, annotations, indications, and Doppler notes. Instructors will review weekly entries and provide individualized feedback.

Method

Reading

Integration

Readings from the required textbook and supplemental resources will provide foundational knowledge of sonography scanning principles and protocols. Students will be expected to take notes and prepare questions, which will support lecture discussions, quizzes, and lab applications.

Method

Discussion

Integration

Discussions will provide opportunities for students to share challenges and strategies for improving scanning technique. Students will reflect on clinical scenarios, explore cultural considerations in patient care, and learn from one another's approaches to inclusive, patient-centered scanning.

Method

Homework

Integration

Homework will include practice activities outside of class, such as written reflections on lab performance, practice quizzes, or preparation of diagrams for the Protocol Pocketbook. These tasks will reinforce course content and prepare students for upcoming lab check-offs and practicals.

Methods of Evaluation

Method

Quizzes

Integration

Quizzes will assess recall and comprehension of terminology, anatomy, scanning planes, echogenicity, and Doppler concepts. These short assessments ensure readiness for lab application.

Method

Exams/Tests

Integration

Exams, such as written midterms, finals, or practical scanning assessments, will evaluate mastery of sonographic principles, anatomy, image interpretation, and Doppler applications. Practical exams, including abdominal and pelvic protocols, will require students to demonstrate technical accuracy, image documentation, Doppler integration, and patient-centered care. Exams will require direct recall and critical thinking without notes or outside resources to prepare students for professional credentialing standards.

Method

Class Performance

Integration

Class performance will be evaluated through active participation in lab sessions, including preparedness, professionalism, teamwork, and respectful peer interactions. Instructors will provide feedback on collaboration, communication, and adherence to patient-centered practices.

Method

Class Work

Integration

Class work will include weekly in-class exercises, such as labeling anatomy on diagrams, identifying probe orientation, or analyzing sample images. These activities will be evaluated for accuracy and engagement and will serve as preparation for lab performance.

Method

Homework

Integration

Homework will include assignments completed outside of class, such as written reflections, diagram preparation, and Protocol Pocketbook entries. Work will be graded for completeness, accuracy, and evidence of critical thinking.

Method

Projects

Integration

Projects will include the Protocol Pocketbook, which will serve as a semester-long individual project. Students will compile diagrams, annotations, Doppler notes, and exam indications for each protocol. Pocketbooks will be graded for accuracy, completeness, and usefulness as a reference tool.

Method

Role-playing/Simulation

Integration

Role-playing and simulation activities will be used to evaluate students' ability to integrate lecture and lab learning into clinical scenarios. Students will review clinical histories, select appropriate protocols, and perform simulated exams on phantoms or peers. Evaluations will include technical skill, problem-solving, professional demeanor, and culturally responsive communication, emphasizing inclusive patient care.

Method

Self-Evaluation

Integration

Self-evaluations will require students to reflect on their own progress following lab check-offs and practicums. These reflections will encourage metacognition and accountability by requiring students to identify strengths, weaknesses, and strategies for improvement.

Assignments

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Read Chapter 4: Abdominal Aorta Scanning Protocol and Chapter 5: Inferior Vena Cava Scanning Protocol from Sonography Scanning: Principles and Protocols (Tempkin). Take notes on terminology, scanning planes, and protocol steps. Bring your notes to class prepared to participate in lecture discussions, quizzes, and lab practice.

Assignment Type

Writing

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Create a Protocol Pocketbook entry for the gallbladder exam. Draw and label required images, annotate as if they were saved on the machine, list common clinical indications, document patient position and transducer choice, and include relevant Doppler notes. Submit your entry for review.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Complete the thyroid check-off. Demonstrate scanning techniques including correct patient positioning, transverse and longitudinal scanning of the thyroid lobes and isthmus, and proper labeling of images. Your technique will be observed, and immediate feedback will be provided. Passing the check-off is required to progress in the course.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Perform a complete abdominal ultrasound exam for the midterm practical. You will be assessed on patient preparation and communication, technical accuracy and efficiency, image quality and optimization, use of Doppler when appropriate, and completeness of documented protocol. Minimum competency is required to pass.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Perform a complete pelvic ultrasound exam for the final practical, including uterus, ovaries, and Doppler applications. You will be assessed on accuracy of anatomy identification, completeness of image documentation, integration of Doppler techniques, and professional inclusive patient interaction. Minimum competency is required to pass.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative
Summative

Assignment
Answer the following exam question:
Question: List three sonographic landmarks used to identify the abdominal aorta in the longitudinal plane.

Assignment Type
Other

In-class and/or outside of class
In-class

Formative or Summative
Formative

Assignment
Complete the following quiz question:
Question: Which vessel lies immediately posterior to the IVC in the longitudinal plane?
a) Aorta
b) Portal vein
c) Right renal artery
d) Left renal vein

Assignment Type
Writing

In-class and/or outside of class
Outside of class

Formative or Summative
Formative

Assignment
Write a reflection after the abdominal practical (½–1 page). Identify one strength, one area for improvement, and one strategy you will use for the pelvic practicum. Connect your technical development to patient-centered care and professional communication.

Assignment Type
Other

In-class and/or outside of class
In-class
Outside of class

Formative or Summative
Summative

Assignment
Final Group Case Presentation: In groups of three, deliver a 10-minute presentation analyzing an assigned patient scenario and ultrasound images provided by the instructor. Evaluate the images for technical accuracy, determine if they meet protocol standards, reflect on how the patient's background (for example, mobility limitation, cultural norm, or body habitus) may affect scanning technique and communication, and propose strategies to improve technical performance and ensure inclusive, patient-centered care.

Course Materials

Textbooks

Tempkin, B. (2015). Sonography Scanning Principles and Protocols, 4th Edition Elsivier. ISBN: 978-1-4557-7321-3

Optional:
Penny, S. M. (2019). Pocket Anatomy & Protocols for Abdominal Ultrasound (1st ed.). Lippincott, Williams & Wilkins.

Penny, S. M. (2025). Pocket Anatomy & Protocols for Obstetrics & Gynecology Ultrasound (1st ed.). Lippincott, Williams & Wilkins.

Class Size Information

Class Size

30

Class Size Category

F - Individualized, skills#based instruction/field practice 30

Diversity and Inclusion

Course Design and Materials: Course will incorporate diverse perspectives, authors, and examples that reflect a variety of cultures, identities, and lived experiences. Instructional materials will be reviewed regularly to ensure representation, inclusivity, and alignment with equity-minded practices across disciplines.

Inclusive Learning Environment: Instructors will establish classroom norms and policies that promote respect, civil discourse, and belonging in both online and face-to-face classes. Clear expectations for communication and engagement will support a learning space where all students feel valued and heard.

Accessible Instruction: Course content will be delivered using accessible design. Materials will follow accessibility guidelines within the CMS, including captioned media, readable document formats, and multiple means of engagement to support diverse learning.

Equitable Teaching Practices: Instructors will use transparent and grading criteria, varied assessment methods, and timely feedback to promote fairness and student success. Opportunities for revision, reflection, and multiple demonstrations of learning may be incorporated when appropriate to the discipline.

Culturally Responsive Pedagogies: Instructional strategies will encourage critical thinking about diverse perspectives and systems of power relevant to the course content. Faculty will foster opportunities for students to connect course material to real-world contexts.

Ongoing Reflection and Improvement: Faculty will engage in continuous professional development related to IDEAA principles and reflect on course practices using metacognition to identify opportunities for increased equity, inclusion, and accessibility.

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

Diversity and inclusion are infused into this course through both lecture content and lab practice. This course teaches diverse content that includes patient scenarios describing situations where gender, culture, race, and disabilities have an impact on patient care. Lectures and discussions incorporate case examples that highlight how these differences may affect patient preparation, modesty, communication, and care. Course objectives and learning outcomes are supported through classroom discussions and simulation of patient care scenarios or case studies, which are presented to foster knowledge, empathy, and patient advocacy in developing future healthcare professionals. Students are also introduced to inclusive terminology and communication strategies that respect gender identity, language access needs, and cultural norms. In the lab, students practice adapting scanning techniques for patients with diverse body types and mobility challenges, reinforcing equitable approaches to patient care. Faculty consistently model professional and culturally sensitive behavior in demonstrations and interactions so that students see inclusive practices applied in real time.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

Assignments, instruction, and evaluation are intentionally designed to promote equity and support diverse learners. The Protocol Pocketbook requires students to document inclusive approaches, such as alternative positioning for patients with mobility limitations or strategies for imaging patients with higher BMI. Reflection assignments encourage students to examine how personal biases may influence communication and clinical practice, fostering self-awareness alongside technical development. Practicum evaluations include criteria for inclusive, patient-centered communication and professionalism, ensuring that DEI principles are formally assessed alongside scanning competency. Peer scanning activities rotate partners to give students practice with varied body types, communication styles, and learning approaches, reinforcing adaptability and respect. Equity is further built into the course structure

by embedding additional lab hours into the schedule, eliminating reliance on optional “open labs” that not all students can access due to work, childcare, or commuting barriers.
The course resources are also offered in multiple formats to meet the needs of different learning styles. Audio learners can utilize voice-over lectures, visual learners can use PowerPoint diagrams, textbooks, lab demonstrations, and videos, and hands-on learners can practice scanning protocols in the campus lab. This multimodal approach ensures that all students, regardless of learning preference, are supported in building the competencies required for success.

Interactions

Explain how the course will incorporate student-to-student interaction.

Students collaborate in lab sessions by practicing scanning on one another and on phantoms. They provide peer feedback on probe handling, image quality, and patient communication. During reflection activities, students compare techniques and share strategies for problem-solving in complex scans. In optional CMS discussion boards, students may post reflections or resources that support one another’s growth.

Explain how the course will incorporate instructor-to-student interaction.

Instructors engage students through live demonstrations of scanning protocols, followed by guided opportunities for students to practice what they observed. Lectures are interactive, allowing students to ask questions and connect new material to prior learning. The CMS houses announcements, syllabi, lecture presentations, and course schedules, providing students with consistent access to resources. Instructors also draw on real-life professional experiences during lectures to enhance understanding of clinical applications and patient care. Students are encouraged to utilize office hours or request individual meetings for additional support, ensuring that guidance and feedback are available beyond scheduled class time. During labs, instructors provide real-time coaching on ergonomics, probe manipulation, image optimization, and Doppler settings, offering structured feedback that helps students refine both technical and professional skills.

Explain how the course will incorporate student-to-content interaction.

Students engage with course content through a combination of readings, multimedia resources, and applied practice. The required textbook functions as both a detailed reference and a protocol imaging manual, supporting the development of foundational scanning skills. Content is reinforced through lecture presentations, accessible captioned instructional videos, and supplemental materials posted in the CMS. In the campus lab, students apply this knowledge by carrying out structured scanning tasks on peers, phantoms, and models, directly connecting theoretical learning to hands-on skill development.

Explain how the course will incorporate student-to-self interaction (metacognitive).

This course provides structured opportunities for students to reflect on their learning and professional growth. Students are encouraged to think critically about how they would plan and carry out a complete sonographic examination, from patient preparation to diagnostic interpretation, with a focus on providing the best possible patient care. Reflection assignments and lab debriefs prompt students to connect classroom learning with real-life clinical experiences, encouraging them to evaluate both their technical performance and their communication with patients. The Protocol Pocketbook also serves as a self-assessment tool, allowing students to track their progress and identify areas for improvement as they build confidence in their scanning abilities.

Key: 1215