**Cluster: Health Science**

**Pathway: Diagnostic**

**State Program Name: Diagnostic Medical Sonographer**

**OCAS Code: 9314 Diagnostic Medical Sonographer**

**CIP Code: 51.0910 Diagnostic Medical Sonography/Sonographer and Ultrasound Technician**

**SOC Code: 29-2032.00 Diagnostic Medical Sonographers**

**Approved Assessments: 8302 Registered Diagnostic Medical Sonographer**

**Description**

Students in this major will learn roles and responsibilities of the sonographer. They will learn body mechanics, scanning techniques, protocols, record keeping, and ethics. They will also learn about the physical and psychological concepts of patient care including routine procedures. Students are introduced to legal and ethics practiced in healthcare, anatomy and physiology, physics, and ultrasound equipment. Students will also learn the theory and techniques for various procedures including abdominal, transabdominal, small parts, and vascular ultrasounds and how to recognize normal and pathologic states during ultrasonic exams. Students are expected to attend clinical rotations that will provide opportunities to practice skills learned during theory. Students will need to obtain certification from the American Registry for Diagnostic Medical Sonography.

**Total Hours Original Framework: 1950**

**Total Hour Recommended: 1600**

**Prerequisites: Associates Degree**

**Requirements in Oklahoma**

**Registered**

**Degreed**

**Program Overview**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hours** |  | **Course Title** |  |
| 60.00 |  | Introduction to Sonography |  |
| 45.00 |  | Patient Care in Sonography |  |
| 45.00 |  | Medical Ethics in Sonography |  |
| 105.00 |  | Abdominal Ultrasound |  |
| 420.00 |  | Sonography Clinical I |  |
| 90.00 |  | OB/GYN Sonography |  |
| 450.00 |  | Sonography Clinical II |  |
| 30.00 |  | Small Parts Sonography |  |
| 15.00 |  | Sonography Bioeffects |  |
| 75.00 |  | Medical Sonographer Review Course |  |
| 425.00 |  | Sonography Clinical III |  |
| 40.00 |  | Advanced Sonography |  |
| 45.00 |  | Vascular Sonography |  |
| 60.00 |  | Ultrasound Physics & Instrumentation I |  |
| 45.00 |  | Ultrasound Physics and Instrumentation II |  |

**Offered at:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Moore Norman Technology Center** |  |  |  |
|  |  |  |  |

**Course Outlines**

**Course Name:** **Introduction to Sonography**

**Course Hours:** 60

**Course Description:** This course introduces students to sonography. Students will learn the history of medical ultrasound, professional and occupational development, and current uses of ultrasound. Body mechanics, scanning techniques, and protocols are introduced.

**Course Objectives:**

1. Demonstrate appropriate communication skills with coworkers, patients, and physicians,

2. Discuss the appropriate patient positioning, planes, and image labeling protocols,

3. Demonstrate knowledge and understanding of human gross anatomy and sectional

anatomy,

4. Discuss the professional organizations associated with sonography,

5. Discuss the accreditation and certification processes,

6. Explain the basic concepts of abd, ob/gyn, small parts, and vascular sonography

evaluation,

7. Recognize the importance of, and employ, ergonomically correct scanning techniques,

8. Demonstrate accurate record keeping relative to sonographic ultrasounds,

9. Apply terminology appropriate to the sonography field.

**Recommended Resources:**

Curry, R. A., & Tempkin, B. B. (2011). Sonography

introduction to normal structure and function, 3rd edition. St. Louis,

MO: Saunders: ISBN: 9781416055563 or Vital Source

9781437727166

Curry, R. A., & Tempkin, B. B. (2011).Workbook and lab manual for

sonography: Introduction to normal structure and function, 3rd edition.

St. Louis, MO: Saunders: ISBN: 9781416055556.

**Course Name:** **Patient Care in Sonography**

**Course Hours:** 45

**Course Description:** In this course, students learn the physical and psychological concepts of patient care. Routine patient care procedures, professional scopes of practice, and record keeping paperwork pertinent to clinical setting are reviewed.

**Course Objectives:**

1) Identify appropriate patient care concerning age, diversity and restraints.

2) Identify the scope of practice for Diagnostic Medical Sonography.

3) Recognize common medical abbreviations and pertinent lab tests.

4) Describe sonographer safety issues.

5) Differentiate the responsibilities of the clinical instructor and the sonography student.

6) Demonstrate professional judgment and discretion in the professional and personal

settings.

7) Perform routine patient care procedures.

**Recommended Resources:**

Craig, M. (2013). Essentials of sonography and patient Care, 3rd edition. St. Louis, MO: Elsevier: ISBN978143773545.

**Course Name:** **Medical Ethics in Sonography**

**Course Hours:** 45

**Course Description:**

This is an introductory course in the ethics of health care. We will lay out the standard ethical theories and apply them to various issues that arise in the health care. Emphasis will be made on understanding of the relationship of current ethical standards to health care delivery.

**Course Objectives:**

1) Contrast the ethical principles and theories to modern health care issues.

2) Discuss the ethical aspects of pursuing a career in a medical profession.

3) Recognize the role of the healthcare provider in ethical dilemmas.

4) Relate his or her professional and personal moral commitments.

5) Evaluate legal issues pertinent to Diagnostic Medical Sonographers.

6) Outline ethical aspects of the Diagnostic Medical Sonography profession.

7) Demonstrate behavior that adheres to the professional codes of conduct.

8) Recognize the importance of continuing education.

9) Employ professional judgment and discretion.

**Recommended Resources:**

Towsley-Cook, D. M., & Young, T. A. (2007). Ethics and legal issues for imaging professionals 2nd edition. St. Louis, MO:Elsevier Mosby: ISBN: 9780323045995.

Craig, M. (2013). Essentials of sonography and patient Care, 3rd edition. St. Louis, MO: Elsevier: ISBN978143773545.

**Course Name:** **Abdominal Ultrasound**

**Course Hours:** 105

**Course Description:** This course is designed to prepare the students for performing transabdominal ultrasounds of the abdomen. It will include the appearance and characteristics of normal anatomy, pathology, pathophysiology, exam protocols, related lab values and imaging

processes

**Course Objectives:**

1) Name the major organ systems and list the organs associated with each.

2) Name the membranes associated with the thoracic and abdominopelvic cavities.

3) Identify normal sonographic appearance of the organs.

4) Describe the abdominal muscles the sonographer would encounter.

5) Position with 100% accuracy a patient for various abdominal ultrasound exam(s).

6) Describe the abdominal ultrasound exam protocols.

7) Explain pathophysiology associated with the various diseases of the abdomen.

8) Recognize normal and abnormal lab values for the abdominal organs.

9) Identify normal and abnormal Doppler patterns of the abdominal structures.

10) Describe the normal size and location of abdominal structures.

11) List the clinical signs, sonographic features, and differentials for normal and

abnormal abdominal structures.

12) Apply terms that describe relative positions, body sections and body regions.

13) Recognize the sonographic appearance of normal tissues structures, including the

following: sectional anatomy, embryology, and normal sonographic patterns.

14) Identify abnormal sonographic appearance of the various abdominal organs.

15) Describe the cross-sectional anatomic relationships of the abdomen.

16) Describe the position, branches, and positional relationships with other structures in

the abdomen of the aorta and IVC.

17) Evaluate anatomic structures in the region of interest.

18) Evaluate a patient health status when provided with appropriate information.

19) Sonographic and Doppler appearance of abdominal disease processes, pathology,

pathophysiology, and abnormal sonographic patterns of: iatrogenic, degenerative,

Inflammatory, traumatic, neoplastic, infectious, obstructive, congenital, metabolic,

and immunologic diseases.

**Recommended Resources:**

Hagen-Ansert, S. L. (2012). Textbook of diagnostic sonography, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN:9780323073011 or Pageburst KNO 9780323137058.

Hagen-Ansert, S.L. (2012). Textbook of Diagnostic sonography workbook, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN: 9780323073004.

**Course Name:** **Sonography Clinical I**

**Course Hours:** 420

**Course Description:**

Practical experience of all clinical duties performed in the ultrasound department. The course provides basic instruction and scanning experience in available aspects of sonography at each unique clinical site and required ultrasound laboratory time.

**Course Objectives:**

Become proficient in all exams that require a proficiency to be completed by the date set forth in the Master Proficiency list*. Each subcategory requires an A or B to pass.* Students will not graduate without passing all proficiencies on the Master Proficiency List. If a student fails a proficiency or doesn’t attempt it, the student will receive a zero test score. The student will meet with program director and/or clinic instructor in this situation. If the student has a failing grade he/she will be removed from the program. The student needs to notify the clinic coordinator, in writing, at least 2 weeks before due date if the student feels he/she will not meet the deadline.

**Recommended Resources:**

Tempkin, Betty Bates (2014). *Ultrasound Scanning Principals and Protocols,* 4th edition.

Philadelphia, PA: W.B. Saunders Company. Sanders,

Roger C, & Winter, Tom (2007). *Clinical Sonography, A Practical Guide*, 4th edition, Baltimore,

MA: Lippincott Williams & Wilkins.

Curry, Reva Arnez & Tempkin, Betty Bates (2011). *Sonography, Introduction to Normal*

*Structure and Function, 3rd edition.* St. Louis, MO: Elsevier Saunders

**Course Name:** **OBGYN Sonography**

**Course Hours:** 90

**Course Description:** This course will prepare students for performing transabdominal and transvaginal ultrasounds of the pregnant and non-pregnant female pelvis. It will include the appearance and characteristics of normal anatomy, pathology, pathophysiology, exam protocols, related lab values, and imaging processes.

**Course Objectives:**

1. Recognize and identify the sonographic appearance of normal anatomic structures of the female pelvis, including anatomic variants and normal Doppler patterns:

• Reproductive system

• Pelvic muscles

• Suspensory ligaments

• Peritoneal spaces

• Pelvic vasculature

2. Describe the location, structure, and function of the following gynecological anatomy:

a. uterus

b. ovaries

c. fallopian tubes

d. broad, round, ovarian, inguinal, and infundibulo-pelvic ligaments

e. cul-de-sac

f. pelvic muscles

g. pelvic vasculature

h. peritoneal spaces

3. Describe how the uterus and ovaries are attached in the pelvis.

4. Define these terms: Estrogen, Progesterone, Luteal phase, Follicular Phase, Luteinizing hormone, Follicle stimulating hormone, Gonadotrophin Releasing Hormone, Human Chorionic Gonadotrophin.

5. Discuss the sonographic appearance of the uterus, ovaries, fallopian tubes, cervix, adnexa, and endometrium.

6. Explain the various stages of the Menstrual Cycle.

7. Indicate normal measurements of uterus, ovaries, cervix, and endometrium.

8. Explain the scanning techniques and protocols for transabdominal, peritoneal, and transvaginal views of gynecological and obstetrical anatomy.

9. Indicate orientation of pelvic organs on transabdominal and transvaginal scans.

10. Describe patient preparation for these exams.

11. Examine how bowel can affect pelvic scanning

12. Recognize the location of the colon, cecum, appendix, and rectum within the pelvis.

13. Discuss congenital anomalies and anatomical variations.

14. Identify relevant laboratory data and other diagnostic testing

15. Describe the sonographic appearance of intrauterine contraceptive device.

16. Select appropriate sonographic equipment for the exam.

17. Recognize and identify the sonographic appearance of normal maternal, embryonic, and fetal anatomic structures during the first, second, and third trimesters:

• Sectional anatomy

• Pertinent measurement techniques

• Doppler applications

18. Recognize and image sonographically

a. First trimester gestational sacs

b. Yolk sac

c. Corpus Luteum Cyst

d. Crown rump length

e. Documentation of fetal life

f. Second trimester pregnancies

g. Third trimester pregnancies

19. Perform sonographic assessment of the following:

a. Fetal position

b. Fetal heart ( rate, outflow tracts)

c. Doppler applications

d. Fetal cranial structures

e. Fetal kidneys, liver, lungs, stomach, bladder, adrenals, aorta, IVC, etc.

f. Amniotic fluid

g. Placenta location

h. Fetal extremities

i. BPD, HC, AC, FL

j. Biophysical profile

k. Congenital anomalies

l. Ectopic pregnancies

20. Examine differential diagnosis for various obstetrical and gynecological pathologies.

21. Recognize, identify, and appropriately document the sonographic appearance of gynecologic disease processes, pathology, and pathophysiology:

• History and physical examination

• Related imaging, laboratory, and functional testing procedures

• Differential diagnosis

• Role of ultrasound in patient management

• Abnormal sonographic patterns:

o Iatrogenic

o Degenerative

o Inflammatory

o Traumatic

o Neoplastic

o Infectious

o Obstructive

o Congenital

o Metabolic

o Immunologic

o Contraceptive devices

o Infertility procedures

o Doppler applications

22. Provide a correlation of clinical signs and symptoms to the appropriate sonographic exam.

23. Annotate images correctly.

24. Practice ALARA.

25. Recognize, identify, and appropriately document the sonographic appearance of gynecologic disease processes, pathology, and pathophysiology:

• History and physical examination

• Related imaging, laboratory, and functional testing procedures

• Differential diagnosis

26. Recognize, identify, and appropriately document the sonographic appearance of obstetric abnormalities, disease, pathology, and pathophysiology:

• History and physical examination

• Related imaging, laboratory, and functional testing procedures

• Differential diagnosis Role of ultrasound in patient management

• Use of three-dimensional obstetric sonography

• Abnormal sonographic characteristics in pregnancy:

o Placenta

o Congenital/genetic anomalies

o Growth abnormalities

o Amniotic fluid

o Viability

o Multiple gestation

o Fetal monitoring

o Maternal factors

o Postpartum

o Fetal therapy

**Recommended Resources:**

Hagen-Ansert, S. L. (2012). Textbook of diagnostic sonography, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN:9780323073011.

Hagen-Ansert, S.L. (2012). Textbook of Diagnostic sonography workbook, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN: 9780323073004.

**Course Name:** **Sonography Clinical II**

**Course Hours:** 450

**Course Description:** Practical experience of all clinical duties performed in the ultrasound

department. The course provides basic instruction and scanning experience in available aspects

of sonography at each unique clinical site and required ultrasound laboratory time.

**Course Objectives:** Become proficient in all exams that require a proficiency to be completed by the date set forth in the Master Proficiency list*. Each subcategory requires an A or B to*

*pass.* Students will not graduate without passing all proficiencies on the Master Proficiency

List. If a student fails a proficiency or doesn’t attempt it, the student will receive a zero test

score. The student will meet with program director and/or clinic instructor in this situation.

If the student has a failing grade he/she will be removed from the program. The student

needs to notify the clinic coordinator, in writing, at least 2 weeks before due date if the

student feels he/she will not meet the deadline. Specific objectives listed—381.

**Recommended Resources:**

Tempkin, Betty Bates (2014). *Ultrasound Scanning Principals and Protocols,* 4th edition.

Philadelphia, PA: W.B. Saunders Company. Sanders,

Roger C, & Winter, Tom (2007). *Clinical Sonography, A Practical Guide*, 4th edition, Baltimore,

MA: Lippincott Williams & Wilkins.

Curry, Reva Arnez & Tempkin, Betty Bates (2011). *Sonography, Introduction to Normal*

*Structure and Function, 3rd edition.* St. Louis, MO: Elsevier Saunders.

**Course Name:** **Small Parts Sonography**

**Course Hours: 30**

**Course Description:** In this course, normal anatomy, various pathologies, and disease processes of the thyroid and parathyroid gland, breast, scrotum, prostate, superficial structures, and musculoskeletal system (MSK) are discussed. Discussions include sonographic appearance, scanning techniques, transducer selection, scanning protocols, pathophysiology, importance of patient history, previous exams, and laboratory values.

**Course Objectives:**

Please note that students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work on time, in good faith, and meet all other course expectations of you as a student.

1) Define key terms associated with the thyroid gland, parathyroid, breast, scrotum, prostate, and musculoskeletal system.

2) Describe the normal sonographic appearance of the thyroid gland, parathyroid, breast, scrotum, prostate, and musculoskeletal system.

3) Explain the function and physiology of the thyroid, parathyroid, breast, prostate, musculoskeletal system, and scrotum.

4) Describe patient history, physical examination, clinical laboratory tests, related diagnostic tests, normal laboratory values, clinical differential diagnosis, and associated physicians in the work-up of thyroid, parathyroid, breast, scrotum, prostate, and musculoskeletal system.

5) Recognize and identify the sonographic appearance of normal anatomic structures, including anatomic variants and normal Doppler patterns: thyroid, parathyroid, breast, prostate, scrotum, and musculoskeletal.

6) Analyze Doppler wave forms of the thyroid, parathyroid, breast, prostate, and scrotum ultrasound exams.

7) Recognize, identify, and appropriately document the abnormal sonographic and Doppler patterns of disease processes, pathology, and pathophysiology of the following structures: thyroid, parathyroid, breast, prostate, scrotum, and musculoskeletal. Modify the scanning protocol based on the sonographic findings and the differential diagnosis:

* History and physical examination
* Related imaging, laboratory, and functional testing procedures
* Clinical differential diagnosis
* Role of ultrasound in patient management

8) Recognize sonographic and Doppler appearance of clinical disease processes, pathology,

pathophysiology, and abnormal sonographic patterns of iatrogenic, degenerative, Inflammatory,

traumatic, neoplastic, infectious, obstructive, congenital, metabolic, and immunologic diseases.

9) Document abnormal sonographic and Doppler patterns of disease processes, pathology, and

pathophysiology of the thyroid, parathyroid, breast, prostate, musculoskeletal system, scrotum, and prostate.

10) Integrate modifications to the scanning protocol based on sonographic findings.

11) Demonstrate the ability to perform sonographic examinations of the superficial structures according to protocol guidelines established by national professional organizations and the protocol of the employing institution utilizing real-time equipment with the appropriate transducers, and Doppler display modes.

**Recommended Resources:**

Hagen-Ansert, S. L. (2012). Textbook of diagnostic sonography, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN:9780323073011.

Hagen-Ansert, S.L. (2012). Textbook of Diagnostic sonography workbook, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN: 9780323073004

**Course Name:** **Sonography Bioeffects**

**Course Hours:** 15

**Course Description:** In this course, online discussions and related exercises will cover thermal, mechanical, and cavitational bioeffect principles. This course will also describe current issues in ultrasound safety.

**Course Objectives:**

1. Comprehend biological effect processes.

2. Implement ways to reduce the patients risk for bioeffects.

3. Discuss various ways of measuring bioeffects.

4. Discuss pertinent in-vitro and in-vivo studies

5. Identify regulations, recommendations, and safety guidelines.

6. Recognize acoustic parameters used to describe diagnostic ultrasound exposure.

7. Summarize current mandated and voluntary regulation of ultrasound usage.

8. Discuss bioeffects research protocols and requirements.

9. Descibe mechanisms of ultrasonic bioeffects including: thermal, cavitational, and mechanical.

10. Discuss major studies of ultrasound bioeffects and benefits.

11. Describe the ALARA Principle

**Recommended Resources:**

Edelman, S. (2012) Understanding ultrasound physics 4th edition: Woodlands, TX: ESP-INC: ISBN: 09626444555.

Safety of Diagnostic Ultrasound, Barnett, Parthenon Publishing Group

**Course Name:** **Medical Sonographer Review Course**

**Course Hours:** 75

**Course Description:**

This course will concentrate on helping to prepare the student to sit for the national certification exam in ultrasound provided by the American Registry of Diagnostic Medical Sonographers (ARDMS). It is a comprehensive course intended to review and emphasize the major areas of importance for national testing.

**Course Objectives:**

1. Review normal anatomy, pathology, pathophysiology, and the disease processes of the abdomen, pelvis, small parts, first, second, and third trimester OB and the vascular system.

2. Review Physics in the following areas: elementary principles, sound propagation, ultrasound transducers, image storage and display, Doppler, artifacts, quality assurance, bioeffects and new technologies.

3. Attempt and pass Davies: Abdominal, Obstetrical, Vascular, and Physics review tests online.

4. Complete the ARDMS Sonography Principles and Instrumentation (SPI) exam with a passing scoring according to the ARDMS exam standards.

**Recommended Resources:**

Odwin, C.S., & Fleischer, A.C.(2012). Lange review for the ultrasonography examination 4th ed. Mcgraw- Hill: ISBN 9780071634243

**Course Name:** **Sonography Clinical III**

**Course Hours:** 425

**Course Description:** This course is a continuation of practical clinical experience in all aspects of abdominal and OB-GYN, small parts, and general vascular Sonography. Students are required to spend twenty-four hours per week in a hospital ultrasound department is required.

**Course Objectives:**

Become proficient in all exams that require a proficiency to be completed by the date set forth in the Master Proficiency list*. Each subcategory requires an A or B to pass.* Students will not graduate without passing all proficiencies on the Master Proficiency List. If a student fails a proficiency or doesn’t attempt it, the student will receive a zero test score. The student will meet with program director and/or clinic instructor in this situation. If the student has a failing grade he/she will be removed from the program.

Prepare, observe, assist and/or perform the following sonographic examinations in class, laboratory and clinical settings:

a) Abdominal

b) Pelvic

c) Small parts to include thyroid, breast, superficial structures and scrotum

d) Ultrasound guided procedures

e) Endocavity

f) Obstetrical

g) General vascular studies

h) Non-cardiac Chest

**Recommended Resources:**

Tempkin, Betty Bates (2008). *Ultrasound Scanning Principals and Protocols,* 3RD edition. Philadelphia, PA: W.B. Saunders Company. Sanders,

Roger C, & Winter, Tom (2007). *Clinical Sonography, A Practical Guide*, 4th edition, Baltimore, MA: Lippincott Williams & Wilkins.

Curry, Reva Arnez & Tempkin, Betty Bates (2011). *Sonography, Introduction to Normal Structure and Function, 3rd edition.* St. Louis, MO: Elsevier Saunders.

Arger, Peter & Iyoob, Suzanne (2004). *The Complete Guide to Vascular Ultrasound*, Philadelphia, PA: Lippincott Williams & Wilkins.

Garbani, Nathalie (2010). *Practical Vascular Technology*, Baltimore, MA: Lippincott Williams & Wilkins.

**Course Name:** **Advanced Sonography**

**Course Hours:** 30

**Prerequisites:** Anatomy and Physiology I

**Course Description:** In this course, normal anatomy, various pathologies, and disease processes of the pediatric and vascular anatomy are discussed. Invasive procedures will also be addressed. Discussions include sonographic appearance, scanning techniques, transducer selection, scanning protocols, pathophysiology, and importance of patient history, previous exams, and laboratory values.

**Course Objectives:**

1. Recognize normal and pathologic states of pediatric anatomy in an ultrasonic examination.  
2. Recognize normal and pathologic states of vascular anatomy in an ultrasonic examination.  
3. Discuss invasive ultrasonic procedures.  
4. Utilize lab findings, patient history and other imaging modalities in ultrasound practice.

**Recommended Resources:**

**Course Name: Vascular Sonography**

**Course Hours:** 45

**Course Description:** This course an introduction to non-invasive vascular ultrasound. It focuses on basic skills and knowledge of image orientation, patient set up, and sonographic performance of vascular exams. Special emphasis is placed on carotid exams, as well as venous and arterial exams of the extremities. Normal and disease processes of the vascular system are discussed.

**Course Objectives:**

1. Identify and describe the normal/abnormal sonographic appearance of neonatal brains, neonatal surgical conditions, neonatal hips, neonatal spines, Transcranial Doppler, and invasive procedures.

2. Assess pertinent information from the patient’s history and/or chart to aid in evaluating these pathologies.

3. Formulate a differential diagnosis based on the ultrasound findings and the patient’s history.

4. Discuss the pathophysiology of these pathologies.

5. Correlate lab tests and values associated with these pathologies.

6. Recognize clinical symptoms of these pathologies.

7. Demonstrate knowledge and understanding of the role of the sonographer in performing interventional/invasive procedures.

8. Identify the sonographic and Doppler appearance of disease processes, pathology, pathophysiology, and abnormal sonographic patterns of iatrogenic, degenerative, Inflammatory, traumatic, neoplastic, infectious, obstructive, congenital, metabolic, and immunologic diseases.

**Recommended Resources**

Hagen-Ansert, S. L.(2012).Textbook of diagnostic sonography, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN:9780323073011.

Hagen-Ansert, S.L.(2012).Textbook of Diagnostic sonography workbook, 7th edition. St. Louis, MO: Elsevier Mosby: ISBN: 9780323073004.

Garbani, N. (2010). Practical vascular technology. Baltimore, MD: Lippincott, Williams & Wilkins: ISBN: 9781582558097.

Arger, P. H., & Iyoob, S. D. (2004). The complete guide to vascular ultrasound. Philadelphia, PA: Lippincott, Williams & Wilkins: ISBN:0781753465

**Course Name: Ultrasound Physics and Instrumentation I**

**Course Hours:** 60

**Prerequisites:** College Algebra

**Course Description:**

This course will introduce the theoretical and practical aspects of ultrasonic physics and instrumentation. It focuses on the characteristics and properties of ultrasound energy, generation, transmission, and reception as related to ultrasound imaging. Physical principles will be investigated. Students should be able to understand the production of quality ultrasound images and apply this information to real-time scanning.

**Course Objectives:**

1. Understand and discuss the fundamental principles of sonography.

2. Define, apply, recognize, and discuss energy concepts, wave propagation,

speed, reflection, diffraction, frequency, period, wavelength, attenuation, power,

intensity, and other physics related terms.

3. Compare and contrast different transducer technologies.

4. Understand and apply formulas related to ultrasound physics.

5. Define, discuss, compare and contrast artifacts.

6. Analyze Doppler and its various modes.

7. Define and identify ultrasonic, audible, and infrasound frequency ranges.

8. Discuss various methods of signal processing.

9. Define, compare, and contrast analog and digital scan converter.

10. Compare various display modes and the cathode ray tube.

11. Define and discuss image storage.

12. Discuss and summarize the ALARA statement.

**Recommended Resources**

Edelman,S. (2012).Understanding ultrasound physics 4th edition: Woodlands, TX: ESP-INC: ISBN: 09626444555.

**Course Name: Ultrasound Physics and Instrumentation II**

**Course Hours:** 45

**Prerequisites:** College Algebra, Instrumentation I

**Course Description:** This course covers ultrasound propagation principles, transducer parameters, interactive properties of ultrasound with human tissue and its possible biological effect, types of equipment and quality control.

**Course Objectives:**

1. Identify various display modes;  
2. Identify Doppler ultrasound principles;

3. Demonstrate knowledge and understanding of acoustic physics, Doppler ultrasound principles, and ultrasound instrumentation;

4. Select the appropriate technique(s) for examination(s) being performed;

5. Adjust instrument controls to optimize image quality;

6. Perform linear, area, circumference, and other related measurements from sonographic images or data;

7. Recognize and compensate for acoustical artifacts;

8. Utilize appropriate devices to obtain pertinent documentation;

9. Minimize patient exposure to acoustic energy;

10. Perform quality assurance;

11. Understand the significance of Emerging Technologies;

12. Apply basic concepts of acoustic physics which include the following:

• Sound production and propagation

• Interaction of sound and matter

• Instrument options and transducer selection

• Principles of ultrasound instruments and modes of operation

• Diagnostic Medical Sonography

• Operator control options

• Physics of Doppler

• Principles of Doppler techniques

• Methods of Doppler flow analysis

• Recording techniques

• Acoustic artifacts

• Harmonics and contrast agents.

**Recommended Resources**

Edelman,S. (2012). Understanding ultrasound physics 4th edition: Woodlands, TX: ESP-INC: ISBN: 09626444555.