

Radiographic and Imaging Sciences; Diagnostic Medical Sonography

Mission Statement

The mission of the Associate in Science Degree Program is to educate students to become competent radiographers who can serve the needs of a diverse patient population in an ethical and compassionate manner. Our basic goals are to:

1. Graduate students who are clinically and technically prepared to enter the current job market.
2. Graduate students who are professional and ethical.
3. Graduate students who communicate effectively in the work care setting.
4. Graduate students who demonstrate clinical thinking and problem-solving skills in classroom, laboratory and clinical settings.

The 24-month Radiographic and Imaging Program is a continuous program which begins each year with Summer Session. The program is designed to prepare a radiographer to perform all diagnostic procedures in an X-ray department, as well as other health settings. The program is accredited by the Joint Review Committee on Education in Radiologic Technology, (312) 704-5300, and the California Department of Public Health, (916) 323-2786. JRCERT accreditation qualifies all graduates of the RT Program to take the Diagnostic Radiography ARRT Certification Examination (provided they have not been convicted of a felony). Anyone convicted of a misdemeanor or felony must pre-apply to the ARRT before entering the program to assure that they will be able to take the national certification examination upon completion of the program.

Courses are arranged in a meaningful sequence and must be taken in the order planned. Progression toward and completion of the Associate Degree requires the attainment of a minimum grade of "C" in all program and adjunct courses. (See "Department

Requirements" to follow.) Campus classes provide theory and laboratory practice, which are correlated with clinical experience in the radiology departments of affiliated institutions. A prescribed, regulation uniform is worn during clinical assignments. Students must provide their own transportation to all facilities and must be willing to travel 50 miles each way to the various clinical sites. Students are required to complete four clinical site rotations at any of the 16 affiliate sites they are assigned to. Clinical site locations extend from Santa Paula to San Luis Obispo. There is no guarantee that the clinic site will be in their city of residence. Any student who misses 10% or more of the clinical portion of the program, in a given semester, is subject to dismissal, pending faculty review.

All students are required to pass a physical exam before entering the program. If, at any time before or after acceptance into the program, the student's conduct or physical or emotional health is such that there is potential threat to the well-being of patients, the applicant will be denied admission to, or be withdrawn from, the major. In addition to the policies and standards of Santa Barbara City College, Health Technologies programs have policies and requirements based on the professional standards and guidelines of their individual regulating state and national accrediting boards. These additional policies and requirements are listed in the *Student Handbook* and are reviewed in RT 101, Introduction to Radiography. All policies, including our pregnancy policy, are available upon request.

Returning students must fill out a petition (within the given timeframe) to be approved before readmission to the program. Each petition will be reviewed on an individual basis and considered on space availability. Limited-license radiographers may be eligible for transfer into the program with advanced standing. Contact the Department Chair (ext. 2504) or the Health Technologies Office (ext. 2366) for further information. Certified radiographers who have completed a hospital-based training program may be eligible for up to 30 units of transfer credit toward an Associate in Arts Degree or for transfer to a California State University. Contact the Department Chair (ext. 2504) for more information. Certified radiographers who wish to complete an Associate in Science Degree in Radiographic and Imaging Sciences at SBCC are required to complete the last two (2) semesters in the program.

Department Offices

Health Technologies Office (A-218, ext. 2366)
 Application Secretary: Lorraine Michalak

Faculty and Offices

Debra McMahan, *Chair* (A-213, ext. 2504)
 Bob Cook (A-240, ext. 2372)
 Bruce Oda (A-245, ext. 4374)

Degrees Awarded

A.S. Degree: Radiography

Department Requirements (69.9 units)

AH 120* — Medical Technology	1.0
RT 101 — Introduction to Radiography	2.3
RT 102 — Fundamentals of Radiographic Positioning & Procedures I	4.0
RT 103 — Fundamentals of Radiographic Positioning & Procedures II	4.0
RT 109 — Principles of Radiographic Exposure	3.0
RT 111 — Advanced Principles of Exposure	3.0
RT 119 — Radiologic Physics	3.0
RT 120 — Patient Care in Radiography	3.0
RT 191 — Radiographic Technology Clinical Practicum 1	4.7
RT 191A — Radiographic Technology Clinical Practicum 1A.....	2.1
RT 192 — Radiographic Technology: Clinical Pract. 2.....	4.7
RT 202 — Advanced Radiographic Procedures.....	3.0
RT 203 — Radiology Certification Preparation.....	4.0
RT 220 — Radiation Biology & Protection.....	3.0
RT 230 — Radiographic Pathology	3.0
RT 250 — Principles & Applications of Cross-Sectional Anatomy in Imaging.....	2.0
RT 293 — Radiographic Technology: Clinical Practicum 3	5.9
RT 294 — Radiographic Technology: Clinical Practicum 4	7.1
RT 295 — Radiographic Technology: Clinical Practicum 5	7.1

**Note: HIT 135 has been approved by the Radiography Department as a possible substitute for AH 120.*

Complete each course with a minimum grade of "C" or better.

Recommended Elective:

- RT 251 — Principles of Mammography & Procedures.....2.0
- RT 290 — Work Experience in Radiography..... 1-4

College Requirements

For complete information, see "Graduation Requirements" in the *Catalog* Index.

Admission Requirements

1. Obtain application in person from the Health Technologies Office (Admin. Bldg., Room 218).
2. High school graduation or equivalency. "Official" high school transcript (in a sealed envelope directly from the school) is required.
3. Eligibility for ENG 110 or 110H — Composition & Reading.
4. Eligibility for MATH 107 or 111 — Intermediate Algebra.
5. Complete BMS 107, Human Anatomy (4 units), and BMS 108, Human Physiology (4 units), or equivalent, with a grade of "C" or better.

Before entering the program, applicant will be required to:

1. Complete RT 100;
2. Attend a Program Orientation Meeting;
3. Complete a physical examination, including immunizations (must be on the SBCC physical exam form which will be provided);
4. Obtain a CPR card—must be kept current throughout the program;
5. Pay required badge and materials fees;
6. Pass a criminal background check and drug screening examination; and
7. Have a valid, government-issued Social Security card prior to testing for the ARRT and CRT board exams after the completion of the program.

Failure to comply with any of the above requirements will make the student ineligible for admission to the program.

Refresher Students

Refresher students are those who are certified as radiographers in California and who want to participate in one or more SBCC Radiographic and Imaging courses. In most cases, this will be done because of a time lapse since being actively exposed to the practice of radiography. To participate in the program, call ext. 2366 for information.

Recommended Program

First Year

Summer Session
Radiography 101

Fall

Radiography 102
Radiography 109
Radiography 120
Allied Health 120
Radiography 191
General Ed. course*

Spring

Radiography 103
Radiography 111
Radiography 119
Radiography 192
General Ed. course*

Winter Intersession
Radiography 191A

Second Year

Summer Session
Radiography 293
General Ed. course*

Fall

Radiography 220

Radiography 230
Radiography 250
Radiography 251
Radiography 294
General Ed. course*

Spring

Radiography 202
Radiography 203
Radiography 295
General Ed. course*

**For a complete listing of General Education requirements, pick up a requirement sheet in the Counseling Center or see "Graduation Requirements" in this Catalog.*

Course Descriptions

Radiographic and Imaging Sciences

RT 100 — Radiography and Health Care (2.0) F, S — CSU

Introduction, overview and orientation for those interested in exploring radiographic imaging or other health care careers. Completion of this course and the prerequisites satisfy departmental requirements for entry into the Radiography Associate Degree Program.

RT 101 — Introduction to Radiography (2.3) F, S — CSU

Prerequisites: RT 100.

Limitation on Enrollment: Passing criminal background check, pass a physical exam, valid CPR card.

Orientation to Radiography, providing students with entry-level information and skills to begin practice in an X-ray department. Topics include ethics, darkroom techniques, introduction to fluoroscopy, lab practice, basic radiation protection and patient care. Course concludes with a one-day orientation to an X-ray department.

RT 102 — Fundamentals of Radiographic Positioning and Procedures I (4) F — CSU

Prerequisites: RT 101.

Precise and detailed information on routine radiographic procedures of the chest, abdomen, appendicular skeleton and vertebral column. Portable and traumatic exams also included.

RT 103 — Fundamentals of Radiographic Positioning and Procedures II (4) S — CSU

Prerequisites: RT 102 with a "C or better."

Basic principles of positioning for the skull, facial bones and various contrast procedures for the gastrointestinal and genito-urinal tract.

RT 109 — Principles of Radiographic Exposure

(3) F — CSU

Prerequisites: RT 101.

Provides first-year radiography students with the basic principles of radiation production and exposure techniques. Photographic and geometric factors which contribute to image quality and detail are discussed.

RT 111 — Advanced Principles of Exposure

(3) S — CSU

Prerequisites: RT 109.

Continuation of RT 109. Advanced analysis of the principles of techniques and their application in the clinical setting are studied. Students learn to calculate changes in technical factors and their effects on image production and quality.

RT 119 — Radiologic Physics

(3) S — CSU

Skills Advisories: Math 4 and Eligibility for ENG 110 or ENG 110H.

Limitation on Enrollment: Concurrent enrollment in the Radiographic Program or employment in the field.

Basic health physics, with an emphasis on electricity and electromagnetic radiation. Special emphasis is on a study of the physics principles applicable to apparatuses and procedures used in current practice of radiology.

RT 120 — Patient Care in Radiography

(3) F — CSU

Provides the student with the concepts of patient care. Routine and emergency patient care procedures are described. Also included are topics on venipuncture and contrast media/medication administration. The role of the radiographer in patient care administration identified. Aspects of death and dying reviewed.

RT 121 — Venipuncture in Radiography

(0.6) F, S — CSU

Provides the student with concepts of venipuncture and contrast media/medication administration. The role of the radiographer in administration of contrast media, legal aspects of contrast media injection, anatomy and physiology related to I.V. injections are covered.

RT 191 — Radiographic Technology Clinical Practicum 1

(4.7) F — CSU

Prerequisites: RT 101.

Introduction to clinical settings and exposure to departmental organization; patient flow; darkroom and processing procedures; observation of techniques employed; and policies and procedures of clinical cases. The student performs basic radiographic procedures under direct supervision.

RT 191A — Radiographic Technology Clinical Practicum 1A

(2.1) Winter — CSU

Designed to give each advanced student the opportunity to improve on clinical skills, as well as accumulate the clinical hours required by the California Department of Health.

RT 192 — Radiographic Technology Clinical Practicum 2

(4.7) S — CSU

Prerequisites: RT 191.

Second in a series of clinical education courses. Student is assigned 16 hours per week at a clinical education center. During this supervised experience, the student observes and performs diagnostic radiographic procedures. The student must demonstrate competency in recently taught radiographic exam, as well as in the exams previously evaluated.

RT 202 — Advanced Radiographic Procedures

(3) S — CSU

Prerequisites: RT 103

Provides the advanced student with a survey of advanced imaging and an introduction to other specializations in the radiation sciences. It concludes with an introduction to special invasive procedures, especially those dealing with the heart/vascular area.

RT 203 — Radiology Certification Preparation

(4)

Review of those subjects deemed critical for the ARRT examination. Consists of lectures, both by the instructor and guest, simulated registry examinations and a computer-assisted learning program.

RT 220 — Radiation Biology and Protection
(3) F — CSU

The biological effects and interactions of ionizing radiation at the cellular level. Dose-effect relationships and long-term somatic and genetic effects of radiation exposure are discussed. The principles and methods of radiation protection, rules and regulations of NCRP, CFR-21 and Title 17 regarding personnel, equipment and departmental design prepare students for state and national certification.

RT 230 — Radiographic Pathology
(3) F — CSU

Introduction to more advanced pathological conditions for second-year students. Differentiates normal radiographic anatomy from pathologic conditions. Encompasses both the anatomy and physiology of each pathologic condition. Students expected to identify, evaluate and present common pathologic conditions throughout the course.

RT 240 — Fluoroscopic Imaging and Radiation Protection
(3) F — CSU

Introduction to the fluoroscopic imaging system and methods of reducing public and occupational dose. Biological effects of high-dose radiation, interactions of ionizing radiation, and state and federal regulations pertaining to protection discussed. Prepares students for National Certification and the California Fluoroscopy Permit Exam.

RT 250 — Principles and Applications of Cross-Sectional Anatomy in Imaging
(2) F — CSU

Provides an understanding of cross-sectional anatomy and knowledge of the relationships of human organs to each other as they appear in the sagittal, coronal and axial plane. The practical applications of cross-sectional with C.T., M.R.I. and ultrasound are emphasized.

RT 251 — Principles of Mammography and Procedures
(2) F — CSU

Prepares the radiographer for state and national certification in mammography. Content covers the anatomy and physiology of the breast, positioning, radiation biology and protection, and QA and QC regulations for mammography equipment.

RT 290 — Work Experience in Radiography
(1-4) F, S, Summer — CSU

Limitation on Enrollment: Enrollment in a Radiology course, or current California Radiologic Technology license and at least one year's experience as a licensed Radiologic Technologist in a medical establishment within the preceding three years.

Consists of supervised on-the-job work experience for students whose radiology career objectives and course of study or employment complement each other. Students must accomplish specific course objectives. Class meetings are scheduled each semester.

RT 293 — Radiographic Technology Clinical Practicum 3
(5.9) Summer — CSU

Prerequisites: RT 192.

Third in a series of clinical education courses, which requires 40 hours per week for eight weeks in the clinical setting. This rotation allows the student opportunity to enhance basic skills, positioning techniques, patient care and understanding of clinical operations. The student must demonstrate continued competency in those exams previously mastered and additional competencies throughout the semester.

RT 294 — Radiographic Technology Clinical Practicum 4
(7.1) F — CSU

Prerequisites: RT 293.

Fourth in a series of clinical education courses to increase technical and clinical proficiency in routine and advanced X-ray procedures under supervision of the clinical coordinator/clinical instructor and departmental radiographers. The student must demonstrate competency of recently taught radiographic exams, plus continued competency of exams previously evaluated.

**RT 295 — Radiographic Technology
Clinical Practicum 5**

(7.1) S — CSU

Prerequisites: RT 294.

Fifth in a series of clinical education courses to increase technical and clinical proficiency in routine and advanced X-ray procedures under supervision of the clinical coordinator/clinical instructor and departmental radiographers. The student must demonstrate competency of recently taught radiographic exams, plus continued competency of exams previously evaluated.

**RT 298 — Diploma Radiography Credit
(30) — CSU**

Skills Advisories: MATH 107 and eligibility for ENG 110 or ENG 110H

Provides an opportunity for registered (ARRT/CRT) radiographers currently licensed in California who have graduated from diploma programs to receive 30 units of program credit toward an Associate Degree. Prior academic and clinical background is assessed by the Program Chairperson before credit is granted.

**RT 299 — Independent Study in Radiography
(1-4) — CSU**

Course Advisories: RT 103.

Limitation on Enrollment: Completion of a minimum of 12 units at SBCC, with a 2.5 G.P.A., and a minimum of 6 units, with a 3.0 G.P.A. within the department.

One to three hours of work/conference time per week to be coordinated with number of enrolled units.

Independent research in radiography under the guidance of a sponsoring faculty member. The project to be consistent with the ability and interest of the student and may be conducted in the laboratory and/or the field. Each unit of credit is equal to three hours of work.

NOTE: Continuation in the clinical area on a full-time basis will take place after graduation. This is done in order to complete the 24-month program requirement and will terminate upon the student's anniversary date.

SONOGRAPHY

Diagnostic Medical Sonography (DMS), sometimes referred to as ultrasound, is a diagnostic medical procedure that uses high frequency sound waves (ultrasound) to produce dynamic visual images of organs, tissues, or blood flow inside the body. Sonography is increasingly being used in the detection and treatment of heart disease, heart attack and vascular disease that can lead to stroke. It is also used to guide fine needle, tissue biopsy to assist in taking a sample of cells from an organ for lab testing (i.e. test for cancer in breast tissue). Unlike X-rays, sonography is a radiation-free imaging modality.

Department Offices

Health Technologies Office (A-218, ext. 2366)

Application Secretary: Lorraine Michalak (A-218, ext. 2366)

Debra vonBernuth, B.A., RDMS, RVT

Nick Spina, B.A., R.T., RDMS

Certificate Awarded

Certificate of Achievement:

Diagnostic Medical Sonography

Entrance Requirements

Before entering the DMS Program, students are required to:

1. Attend a DMS orientation meeting the semester prior to entry;
2. Complete the SBCC physical examination on SBCC form including immunizations;
3. Obtain a CPR card, which must be kept current throughout the program;
4. File a college application in the Admissions Office, the semester prior to beginning classes at SBCC; and
5. Pass a criminal background check and drug screening examination.

Application Procedure

Submit the following to SBCC Health Technologies Office:

- Completed DMS application
- A copy of professional license
- Official transcripts

Certificate Requirements for Diagnostic Medical Sonography

Limitation on Enrollment: To enroll in DMS 150 and 155, students must have one of the following:

1. Completion of a two-year allied health education program that is patient-care related: Radiographic/Radiologic Technologist (R.T.), Respiratory Therapist (R.T.), Registered Nurse (R.N.), Occupational Therapist (O.T.), Physical Therapist (P.T.)

OR

2. Bachelor's Degree with these prerequisites:
 Anatomy (BMS 107 for 4 units at SBCC)
 Physiology (BMS 108 for 4 units at SBCC)
 Medical Terminology (AH 120 for 1 unit at SBCC)
 Patient Care in Radiography (RT 120 for 3 units at SBCC)

OR

3. Medical Doctor (M.D.) or Doctor of Osteopathy (D.O.) degrees from outside of the U.S., equivalent to those of the U.S. and Canada

Please Note: RT 120 (Patient Care in Radiography) is a prerequisite to DMS 182 (Clinical Experience I).

Required Core Courses (53.9 units)

DMS 150 — Physics & Instrumentation	3.0
DMS 155 — Abdominal & Small Parts Scanning	2.8
DMS 156 — OB/GYN Scanning	2.7
DMS 160 — Pathophysiology.....	3.0
DMS 165 — Abdom. & Small Parts Scan. & Pathol	3.0
DMS 166 — OB/GYN Scanning & Pathology.....	2.0

DMS 170 — Introduction to Vascular Ultrasound	4.0
DMS 182 — Clinical Experience I	9.0
DMS 183 — Clinical Experience II	9.5
DMS 184 — Clinical Experience III	2.4
DMS 185 — Clinical Experience IV	9.5
DMS 250 — Sonography Interpretation	3.0

Length of Program

This is an 18-month Certificate program in which courses are arranged in a meaningful sequence and must be taken in the order planned. The program begins each year with the start of the college's Fall Semester.

Fall Session

DMS 150 — Physics & Instrumentation	3
DMS 155 — Abdominal & Small Parts Scanning	2.8

Spring Semester

DMS 156 — OB/GYN Scanning.....	2.7
DMS 160 — Pathophysiology.....	3
DMS 165 — Abd & Small Parts Scanning & Pathology.....	3

Winter Intersession

DMS 183 — Clinical Experience II	9.5
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Fall Semester

DMS 166 — OB/GYN Scanning & Pathology.....	2
DMS 170 — Introduction to Vascular Ultrasound	4
DMS 184 — Clinical Experience III	2.4

Summer Session

DMS 182 — Clinical Experience I	8.9
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Spring Semester

DMS 250 — Sonography Interpretation	3
DMS 185 — Clinical Experience IV	9.5

Course Descriptions

Diagnostic Medical Sonography

DMS 150 — Physics and Instrumentation

(3) Fall — CSU

Limitation on Enrollment: Must have certification as R.T., R.N.

Introduction to the basic acoustical physics and acoustical waves in human tissue. Emphasis is on ultrasound transmission in soft tissues, attenuation of sound energy, parameters affecting sound transmission and resolution of sound beams.

DMS 155 — Abdominal and Small Parts Scanning

(2.8) Fall — CSU

Limitation on Enrollment: Must have certification as R.T., R.N.

Interpretation of normal anatomy, sonographic and gross anatomy, demonstrating scanning techniques and identifying normal sonographic protocols for abdomen and small parts.

DMS 156 — OB/GYN Scanning

(2.7) S — CSU

Prerequisites: DMS 155

Interpretation of normal anatomy, sonographic and gross anatomy, demonstrating scanning techniques and identifying normal sonographic protocols for OB/GYN.

DMS 160 — Pathophysiology

(3) S — CSU

Prerequisites: None

Specific study of pathology and pathophysiological mechanisms related to diagnostic medical sonography.

DMS 165 — Abdominal and Small Parts Scanning and Pathology

(3) S — CSU

Prerequisites: DMS 155

Interpretation of normal and abnormal anatomy of abdomen and small parts, sonographic and gross anatomy, comparing one disease to another. Identification of pathophysiological anatomic structures in various sonographic planes and images.

DMS 166 — OB/GYN Scanning and Pathology

(2) F — CSU

Interpretation of normal and abnormal OB/GYN anatomy, sonographic and gross anatomy, comparing one pathological condition to another. Identification of pathophysiological anatomic structures in various sonographic planes and images.

DMS 170 — Introduction to Vascular Ultrasound

(4) S — CSU

Prerequisites: DMS 150

Introduction to Doppler (color flow), with a hands-on approach. Overview of normal and pathological sonographic data: arterial and venous peripheral vascular, abdominal vasculature and extracranial carotid.

DMS 182 — Clinical Experience 1

(9) Summer — CSU

Prerequisites: RT 120

Introduction to the clinical setting and exposure to departmental organization, policies and procedures, patient flow, darkroom and processing procedures; and observation of clinical case techniques and protocols.

DMS 183 — Clinical Experience 2

(9.5) F — CSU

Prerequisites: DMS 182

Continuation of clinical experience. Exposure to departmental organization, policies and procedures, patient flow, darkroom and processing procedures, observation of clinical case techniques and protocols. Beginning hands-on experience and equipment set-up.

DMS 184 — Clinical Experience 3

(2.4) F — CSU

Prerequisites: DMS 183

Clinical experience in ultrasound; equipment handling and patient management; and departmental operations and scope.

DMS 185 — Clinical Experience 4

(9.5) S — CSU

Prerequisites: DMS 184

Intermediate clinical experience; sonographic study of the abdomen, small parts and pelvis with real-time equipment; and recognition of anatomical pathology.

DMS 250 — Sonography Interpretation

(3) S — CSU

Prerequisites: DMS 181

Interpretation and critique of normal anatomy with correlation of didactic, clinical presentations and critiques. Written and oral case presentations, with emphasis on OB/GYN subjects.

DMS 290 — Work Experience in Sonography

(1-4) F — CSU

Limitation on Enrollment: Enrollment in a Sonography course, or current Sonography license and at least one year's experience as a licensed Sonographer in a medical establishment within the preceding three years.

Consists of supervised on-the-job work experience for students whose radiology career objectives and course of study or employment complement each other. Students must accomplish specific course objectives. Class meetings are scheduled each semester.