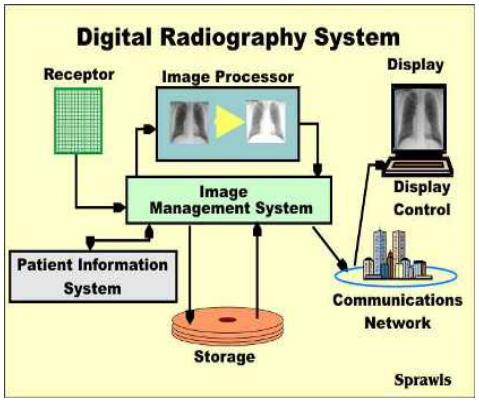
SALT LAKE COMMUNITY COLLEGE
Radiologic Technology Program

Course Syllabus



Course and Credit Hours: RADS 1130, 4 Credit hours

Name of Course: Radiographic Imaging II

Semester and Term:

Class Location and Time:

Instructor and Phone:

Office Location:

Mailbox Location:

Email Address:

Consultation Hours:

Textbook: Principles of Radiographic Imaging, by Carlton and Adler 6th

Required Equipment: Edition Calculator

Link or Instructions for Accessing Online Course Materials: Power Points, worksheets and reviews for this course will be available on Canvas.

Library Link: For a list of resources that support the program, go to: http://libguides.slcc.edu/content.php?pid=16754

Prerequisite: Completion of prior semester courses per established curriculum plan.

Course Description: Students will study electricity, electromagnetism, equipment, AEC, & digital imaging. They also learn how to alter exposure factors to control IR exposure, contrast, spatial resolution and distortion.

SLCC Student Learning Outcomes:
SLCC is committed to fostering and assessing the following student learning outcomes in it programs and courses:

1. Acquire substantive knowledge in the intended major and throughout General Education
2. Communicate effectively
3. Develop quantitative literacies necessary for the chosen field of study
4. Think critically
5. Express themselves creatively
6. Develop civic literacy and the capacity to be community-engaged learners who act in mutually beneficial ways with community partners
7. Develop the knowledge and skills to work with others in a professional and constructive manner
8. Develop information literacy
9. Develop computer literacy

Student Learning Outcomes:
Students are assessed in this course with discussions, assignments, problem solving activities, quizzes and examinations:

1. Explain the concepts and calculations associated with electricity. (SLO: 1,3,4)
2. Describe the components and functionality of transformers, generators, motors and rectifiers. (SLO: 1,3,4,8)
3. Discuss various diagnostic equipment and differentiate the various circuits in an x-ray unit (SLO:1,2)
4. Explain how AEC works and how to correct timer problems (SLO: 1,3,4)
5. Differentiate and examine CR and DR imaging systems. (SLO:1,4,8,9)
6. Identify how medical informatics are utilized and monitored in medical imaging. (SLO:1,9)
7. Make recommendations on how to achieve images that have adequate contrast, IR exposure, spatial resolution and reduce distortion. (SLO: 1,2,4,9)

Chapter Objectives:

ELECTRICTY, CHAPTER 3
1. Explain the atomic nature of electricity.
2. State the elementary laws of electrostatics
3. Describe the methods of electrification.
4. Interpret the results of various electrostatic interactions.
5. Differentiate conductors from insulators.
6. Describe the basic factors of electrodynamics.
7. Calculate the effect of changes in voltage, amperage and resistance according to Ohm's law.
8. Calculate voltage, amperage, and resistance in simple series and parallel circuits.

ELECTROMAGNETISM, CHAPTER 4
1. Explain the atomic nature of magnetism.
2. Classify materials according to their magnetic properties
3. State Fleming's hand rules of electromagnetics.
4. Explain how a solenoid and an electromagnet function.
5. Describe magnetic and electromagnetic induction.
6. List the types of movement that will produce electromagnetism.
7. State the factors that regulate the strength of electromagnetic induction.
8. Explain self-induction.
9. Illustrate the generator and motor principles.
10. Explain the waveform produced by direct – and alternating-current generators and motors.
11. Describe the function of a transformer.
12. Calculate voltage and amperage according to the transformer law.
13. Discuss various factors affecting transformer efficiency and construction.
14. Explain the function of an autotransformer and a capacitor.
15. Describe the function of a silicon-controlled rectifier at the atomic level.
16. Describe the process of thermionic emission.
17. Explain the waveforms that are produced by half-wave and full-wave rectification.

X-RAY EQUIPMENT, CHAPTER 6
1. Describe various diagnostic equipment, table, tube-support and ancillary equipment configurations.
2. State incoming line current characteristics.
3. Describe the difference between single-phase and three-phase power.
4. Explain the functions of the basic components of the main and filament x-ray circuits.
5. Discuss the differences between single-phase, three-phase six- and twelve-pulse, and high-frequency waveforms on generator output.

6. Describe the function of capacitor discharge and battery-operated mobile units.
7. Differentiate phototimers from ionization chamber automatic exposure controls.
8. Describe the placement and function of a phototimer and an ionization chamber automatic exposure control.
9. Describe potential problems that could be caused by minimum reaction times.
10. Justify the use of backup time when using automatic exposure controls.

AEC, CHAPTER 7

1. Explain why the art of AEC is the art of positioning
2. Accurately identify the configuration, size, shape and position for ionization chamber
3. Describe how to modify image receptor exposure when using an automatic exposure control
4. Describe various common subject density and subject contrast problems when using AEC.
5. Explain the effect of collimation on AEC image quality.
6. Provide solutions to minimum response time and backup time problems.
7. Explain how to modify the suggested technical factors on an automatically programmed control unit.
8. Discuss the advisability of the creative use of AEC.

DIGITAL IMAGE PROCESSING, CHAPTER 20

1. Discuss the various types of digital radiography systems.
2. Describe the process of digital image data formation.
3. Explain the types of digital image processing operations.
4. Describe the process by which the histogram is acquired and the look-up-table is applied to the collected data.
5. Explain the function of digital image window level and width controls.
6. Describe the factors that affect digital image quality.
7. Explain how exposure indicators can be used as a quality control tool and for radiation protection.

COMPUTED RADIOGRPHY, CHAPTER 21

1. Describe the CR imaging process.
2. Discuss the construction and characteristics of the photostimulable image plate.
3. Describe latent image formation.
4. Explain the process of photostimulated luminescence.
5. Describe the two steps involved in image processing
6. Discuss the impact of technical factors on CR imaging quality.

DIGITAL RADIOGRPHY/FLAT-PANEL DETECTOR SYSYTEM, CHAPTER 22

1. Differentiate the flat-panel detector types.
2. Explain critical elements used in flat-panel detectors.
3. Clarify the differences in image acquisition between indirect and direct DR systems.
4. Explain auto-detection panel technology.
5. Discuss DR panel precautions.

TECHNICAL CONSIDERATIONS IN DIGITAL IMAGING, CHAPTER 23

1. Describe the principles of technical factor selection.
2. Disuses the scale of deviation index values, and corrective actions.
3. Explain how exposure factor affect digital image quality.
4. Explain latitude differences between digital systems
5. Analyze why digital imaging systems are prone to ALARA violations.
6. Explain the causes of digital radiography artifacts.

INFORMATICS IN MEDICAL IMAGING, CHAPTER 24

1. Define biomedical informatics and clinical informatics.
2. Describe the various platforms and applications used in medical imaging departments.
3. Discuss the basic standards involved in informatics
4. Explain the fundamental elements of computer and network architecture

5. Identify types of storage for digital images
6. Explain the workflow for medical imaging from order to report distribution including CPOE and CDSS.
7. Discuss security for informatics

IMAGE RECEPTOR EXPOSURE, CHAPTER 26

1. Identify density/image receptor exposure (IR) as a prime component of the photographic properties controlling visibility of detail of radiographic image quality.
2. Define density and IR exposure.
3. Describe the effects of density/IR exposure changes on image appearance.
4. Describe the process of evaluating image density/IR exposure.
5. Explain why mA and time are the controlling factors of density/IR exposure.
6. Explain how each of the influencing factors affect image density/IR exposure.
7. Assess density/IR exposure on various radiographic images.
8. Recommend appropriate adjustments to compensate for variation in the controlling and influencing factors that affect density/IR exposure.

CONTRAST, CHAPTER 27

1. Identify contrast as a prime component of the photographic properties controlling visibility of detail of radiographic image quality.
2. Explain the various terms used to describe contrast/dynamic range.
3. Define radiographic contrast and the factors that affect it.
4. Describe the factors that affect image receptor contrast.
5. Describe the factors that affect subject contrast.
6. Describe the effects of contrast changes on image appearance.
7. Determine the technical factor changes necessary to achieve optimal contrast.
8. Assess radiographic contrast on various radiographic images.
9. Recommend appropriate adjustments to improve contrast under various conditions.
10. Explain how each influencing factor affects image contrast.

SPATIAL RESOLUTION, CHAPTER 28

1. Define spatial resolution, including synonymous terms and derived units.
2. Explain the effect of various distances on spatial resolution.
3. Describe the factors that affect penumbra size/point spread function size.
4. Describe the effect of digital imaging systems on spatial resolution.
5. Explain digital image receptor factors that control spatial resolution.
6. Describe appropriate techniques to prevent patient motion.
7. Synthesize various geometrical factors into clinical protocols for improving resolution.
8. Recommended techniques for reducing motion, including immobilization devices.

DISTORTION, CHAPTER 29

1. Define size and shape distortion.
2. Explain the effects of SID and OID on image distortion.
3. Discuss various methods of minimizing distortion through variation of SID and OID.
4. Explain why elongation and foreshortening are relational definitions.
5. Describe the routine relationships between central ray, anatomical part and image receptor.
6. Explain the proper terms used to describe angulation direction and degree.
7. Differentiate distorted images from routine projections.
8. Calculate the magnification factor when given SID and SOD.
9. Calculate the actual size of an object when given the projected size, SID and OID.
10. Describe adjustments of SID and OID that will minimize magnification.
11. Describe adjustments of central ray, anatomical part and image receptor that will minimize shape distortion.

Course Requirements:

Tests and Quizzes. As per the Student Handbook, **tests and quizzes must be taken on the day assigned at the designated time. In the event the student will miss a test or quiz, they must call or e-mail the instructor** PRIOR **to the designated test start time. Phone messages are acceptable.** IF THE STUDENT DOES NOT CALL OR E-MAIL PRIOR TO THE TEST OR QUIZ START TIME, the student must take the test with an automatic 50% deduction.

All test and quizzes are to be made up by or on the 1st class day the student returns. It is the student's responsibility to initiate making up tests and quizzes. If they fail to do so, they forfeit the opportunity to take the test or quiz.

Attendance. As per the Student Handbook, **attendance in class is** extremely **important. You are forming work habits and a reputation that will follow you into the professional environment. You are expected to be present for all courses and participate in planned activities. It is the responsibility of the student to obtain notes, handouts or assignments given on any missed day.** *Students who have absences in excess of 20% of total attendance time in each course will be terminated from the program*

Student Responsibilities. Students are expected to complete reading assignments prior to scheduled class/lab times. Students should have completed worksheets, etc. and be prepared to discuss the material knowledgeably. If the student is having difficult in the course, it is the student's responsibility to make arrangements to take with the Instructor. Students are expected to be self-directed and motivated in identifying their learning needs associated with the course content.

Assignments. Each assignment has a specific due date as noted on the course schedule. No late assignments will be accepted.

Incomplete. Students must complete all requirements and receive a C grade or higher in each course to remain in the program.

Late work. Late work is not accepted.

Class Procedure or Format:
Material will be presented in lectures, discussions, assignments and problem solving activities.

Grading will be as follows:

Quizzes	**24%**

There will be 6 quizzes total, so each quiz will be worth 4%.

Test 1 Ch. 3, 4, 6 and 7	**25%**
Test 2 Ch. 20, 21,22 and 24	**25%**
Post processing assignment	**1%**
Test 3 Ch. 26, 27, 28, and 29	**25%**

Grading:

95-100	**A**	75-77	**C**
90-94	**A-**	71-74	**C-**
87-89	**B+**	67-70	**D+**
83-86	**B**	64-66	**D**
80-82	**B-**	Below 64	**E**
78-79	**C+**		

Only parts of this section apply due to Covid.

Wireless Devices in the Classroom:
The advent of technology use in the classroom as an instructional tool has caused both opportunities and distractions. Wireless devices cause individual inattentiveness and can make it difficult for others to stay focused. The following policies are in effect during class:

1. Cell phones, iPods/Pads, pagers, High-Resolution DVR Spy pens with webcam, microphones, recorders or any other wireless devices (excluding ADA authorized devices) that may distract from the class are to be silenced and/or set to vibrate mode before entering the classroom and may not be on the desk during class. This allows students to receive SLCC emergency notifications through email or text messaging alerts.

2. Wireless devices can be checked during class breaks outside the classroom.

3. You are expected to engage in discussion for the class. If you are discovered engaging in reading/texting messages, surfing the web and engaging in other computer activities not directly related to class, you will be asked to leave the class and will be counted as absent for that class session.

5. You may not record or publish information from the class without written authorization from the instructor. If used without written authorization, you will have violated "Privacy/Intellectual Property Rights".

Student Handbook:
Students must adhere to all policies and procedures of the Radiologic Technology Program as documented in the Student Handbook. It is the student's responsibility to be aware of, and follow, all requirements as listed in the Handbook.

Emergency Evacuation Procedures
In case of an emergency situation, elevators should not be used as emergency exits. All class members should exit through the nearest doors on the west side of the building, then proceed toward the round-about on the northeast side of the building. We will then verify that all students are accounted for and unharmed. Please inform your instructor if you require assistance or accommodation during an evacuation. The instructor will identify several students in the class that are willing to provide assistance. If you have a disability, please notify your instructor and fill out an Evacuation Information Form

The SLCC Department of Public Safety is using an app called the Crisis Manager to inform students and staff about Emergency Procedures. The app allows SLCC to instantly update these procedures. To download this app go to the App Store or Google Play Store, type **SchoolDude CrisisManager** in the search box and click "Get" or "Install. For questions regarding the Emergency Procedures or downloading the app to your device, please contact [redacted]

Academic Grievance Policy

In accordance with the Salt Lake Community College Student Code of Conduct, http://www.slcc.edu/policies/docs/Student_Code_of_Conduct.pdf, the grievance policy for students with reference to academics can be found in Section III. Students are encouraged to seek resolution with the instructor(s) whenever possible.

It is the goal of the School of Health Sciences to be forthright and consistent with specific academic policies throughout divisions and programs. This policy singularly addresses academic issues and the general principles for disciplinary actions as noted in the Student Code of Conduct Section III. It should be noted it is up to the faculty's discretion to provide warning (verbal or written), suspension, or dismissal based upon program policy and severity of the issue at hand. It is realized in some health sciences programs a failing grade, as stated in the syllabus and/or policy manual, may result in program dismissal.

STEP ONE: A student has the right, as per college policy, to grieve a grade, warning (verbal or written), suspension, or dismissal received within a program of study. A student, as per policy, must make an appointment to meet with the instructor of the class. A meeting, for anything other than a final grade, should be made within ten (10) days of the incident. Final grade disputes require a meeting within 30 days of the student receiving the grade. Every effort should be made to find resolution and provide evidence from both parties with respect to the grade issued.

STEP TWO: If a resolution cannot be made, the student must request in writing five (5) business days from the date of meeting with the faculty, a committee review of the grievance to the Associate Dean of the specific division. The grievance will be reviewed by a committee consisting of three (3) to five (5) faculty outside the program in which the student is enrolled. This will include the following members, the Associate Dean and two to four faculty members outside the discipline. The Associate Dean will serve as committee chair. One faculty and the program coordinator of the program involved in the grievance can attend the procedure, as can the student with one representative. Each of these parties will only be allowed to present evidence to the committee and not vote on the issue in question. Legal representation is allowed by either party. The proceedings will be recorded for accuracy. Upon completion of the proceedings, the committee ONLY will vote on the issue(s) noted in the student's grievance. A formal letter will be provided by the committee chair within ten (10) business days of the end of the proceeding with the committee's decision regarding the issue.

STEP THREE: If the student is not satisfied with the outcome, they may appeal to the Academic Dean of the School of Health Sciences. This must be done in writing within five (5) days of receiving the formal letter from the grievance committee chair. The Dean will review the appeal, all evidence, and render a decision to the student within ten (10) days of receiving the formal letter from the student. The decision of the Dean of the School of Health Sciences is final and cannot be appealed.

SLCC Institutional Resources:
For information on SLCC Institutional Resources, please refer to the link on Canvas under Institutional