

South Plains College-Reese Campus
Course Syllabus

COURSE: **RADR 1213.200 (2:2:0), Principles of Radiographic Imaging I**
SEMESTER: **Fall 2016**
CLASS TIMES: **MW, 10:30-11:20**
INSTRUCTOR: **Clinton Bishop**
OFFICE: **RC 512B**
OFFICE HOURS: **MTWR 08:00 – 11:00; by appointment**
OFFICE PHONE: **806-716-4929**
E-MAIL: cbishop@southplainscollege.edu
Facebook: The radiologic technology program has a Facebook page at www.facebook.com/spradiologictechnologyprogram. In addition to the South Plains college websites, this Facebook page will be used to keep students up-to-date on program activities, weather delays, South Plains college announcements and will help with program recruitment. "Liking" the radiologic technology program's Facebook page is not mandatory, nor are personal Facebook accounts in order to access this page.
BlackBoard: Blackboard is an e-education platform designed to enable educational innovations everywhere by connecting people and technology. This education tool will be used in this course throughout the semester.

"South Plains College improves each student's life."

GENERAL COURSE INFORMATION

COURSE DESCRIPTION

This course focuses on radiographic image quality and the effects of exposure variables.

PURPOSE

This course will provide students with the technical information required to produce a diagnostic radiographic image and prepare the student for a meaningful clinical experience.

STUDENT LEARNING OUTCOMES

The student will:

1. Control radiographic exposure and image production using the fundamental technical factors of mAs, kVp and SID.
2. Select appropriate technical factors and accessory equipment to enhance the radiographic exposure and image production.
3. Identify the characteristics of a diagnostic radiograph.
4. Assess radiographic images for optical density, contrast and recorded detail.

COURSE OBJECTIVES

The student will:

1. Adhere to strict radiation protection standards using time, distance and shielding for patient, visitor, staff and himself/herself.
2. Use the appropriate radiographic unit of measure when discussing radiation exposure and radiation dose.
3. Select and control radiographic exposure technique factors that will produce a beam of radiation capable of producing a diagnostic radiographic image.
4. Identify characteristics of electromagnetic radiation and explain their relationship to each other.
5. Differentiate between electromagnetic radiation and particulate radiation.

6. Describe the processes of x-radiation and heat production in the x-ray tube.
7. Identify the characteristics of a primary x-ray beam.
 8. Describe the possible interactions between x-radiation and matter.
 9. Select and control radiographic exposure technique factors that will produce a diagnostic radiographic image.
10. Assess a radiographic image for diagnostic optical density, contrast and recorded detail.
11. Analyze and adjust appropriate factors to obtain a diagnostic radiograph.

EVALUATION METHODS

The course grade will be determined by a combination of major exams and a comprehensive final exam. The following guidelines will be followed regarding exams:

- The student is expected to complete a major exam at the scheduled time. **Make-up exams will be at the instructor's discretion.**
- A student arriving late for a major exam will not be allowed to take the exam if any student has completed the exam and left the classroom.
- All major exams must be completed within the designated class time.
- A comprehensive final exam will be given during the time designated by South Plains College.
- It is the responsibility of the student to bring an appropriate calculator to class. **NO CELL PHONES ALLOWED WHILE TESTING (even to use as calculators). Students will not be allowed to share calculators during an exam.**

ACADEMIC INTEGRITY

It is the aim of the faculty of South Plains College to foster a spirit of complete honesty and a high standard of integrity. The attempt of any student to present as his or her own any work which he or she has not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offender liable to serious consequences, possibly suspension.

Cheating - Dishonesty of any kind on examinations or on written assignments, illegal possession of examinations, the use of unauthorized notes during an examination, obtaining information during an examination from the textbook or from the examination paper of another student, assisting others to cheat, alteration of grade records, illegal entry or unauthorized presence in the office are examples of cheating. Complete honesty is required of the student in the presentation of any and all phases of coursework. This applies to quizzes of whatever length, as well as final examinations, to daily reports and to term papers.

Plagiarism - Offering the work of another as one's own, without proper acknowledgment, is plagiarism; therefore, any student who fails to give credit for quotations or essentially identical expression of material taken from books, encyclopedias, magazines and other reference works, or from themes, reports or other writings of a fellow student, is guilty of plagiarism.

If found cheating or plagiarizing, the student's future in this program will be based on the decisions from the Allied Health Departmental Director's Committee.

SCANS and FOUNDATION SKILLS

Scans and foundation skills are identified for specific course objectives. A complete list explaining these skills is attached to the back of the syllabus for your information.

SPECIFIC COURSE INFORMATION

TEXT AND MATERIALS

Bushong, Stewart C. Radiologic Science for Technologists. 10th Edition. 2013. Elsevier/Mosby.

ATTENDANCE POLICY

SPC - Students are expected to attend all classes in order to be successful in a course. The student may be administratively withdrawn from the course when absences become excessive as defined in the course syllabus.

When an unavoidable reason for class absence arises, such as illness, an official trip authorized by the college or an official activity, the instructor may permit the student to make up work missed. It is the student's responsibility to complete work missed within a reasonable period of time as determined by the instructor. Students are officially enrolled in all courses for which they pay tuition and fees at the time of registration. Should a student, for any reason, delay in reporting to a class after official enrollment, absences will be attributed to the student from the first class meeting.

Students who enroll in a course but have "Never Attended" by the official census date, as reported by the faculty member, will be administratively dropped by the Office of Admissions and Records. A student who does not meet the attendance requirements of a class as stated in the course syllabus and does not officially withdraw from that course by the official census date of the semester, may be administratively withdrawn from that course and receive a grade of "X" or "F" as determined by the instructor. Instructors are responsible for clearly stating their administrative drop policy in the course syllabus, and it is the student's responsibility to be aware of that policy.

It is the student's responsibility to verify administrative drops for excessive absences through MySPC using his or her student online account. If it is determined that a student is awarded financial aid for a class or classes in which the student never attended or participated, the financial aid award will be adjusted in accordance with the classes in which the student did attend/participate and the student will owe any balance resulting from the adjustment.

SPC Radiologic Technology - Class attendance is mandatory. Students with 3 absences will be counseled. Students are allowed 5 absences during fall semester. After the 5 absence, the student will be dropped from the program, regardless of the student's grade. Policies regarding absences coincide with those established for South Plains College as outlined in the SPC General Catalog.

It is extremely important that students arrive for class **on time**. **Tardiness** disrupts the instructor and the other students. Students who chronically arrive late will be counseled. The student should be prepared for class at the scheduled class start time. **3 tardies will equal 1 absence.**

Students with perfect attendance and two or less tardies will be awarded 2 points to their final grade at the end of the semester.

INSTRUCTIONAL METHODS

The student will receive course information through a series of lectures, PowerPoint presentations, lab assignments, and textbook assignments.

CLASSROOM PARTICIPATION

Attending class regularly will provide the student opportunity to supplement their reading assignments and acquire a better understanding of the course material. Class time missed will result in information gaps and will increase course difficulty. It is the student's responsibility to attend class which will enable him or her to take notes, ask questions, and participate in class discussions. Information handouts may be given in certain instances, but the student should not rely on them. The student is encouraged to take adequate notes during class. Recording class is permitted.

ASSIGNMENT POLICY

The student is responsible for being prepared for class, which means reading the assigned chapters and/or pages from the textbook prior to class. The textbook is a mandatory requirement. **The student must bring the textbook/e-book to every class.** In some instances, information from the reading assignments not covered during class may be included on an exam.

REVIEW

If a student needs assistance with reviewing any of the information given during class or lab, the student is encouraged to make an appointment with the instructor.

CONFERENCES

If at any time a student is not satisfied with their overall performance, he/she is encouraged to schedule an appointment with me. If necessary, a plan can be developed to help the student improve in their areas of weakness.

GRADING RUBRIC

Grades in this course will be determined using the following criteria:

Assessment Tool	Assessment Criteria	Percentage Score	Grade
MAJOR EXAMS 70%	✓ Exceptional unit content knowledge & understanding	90 – 100	A
	✓ Good unit content knowledge & understanding	80 – 89	B
	✓ Average unit content knowledge & understanding	75 – 79	C
	✓ Insufficient unit content knowledge & understanding	0 – 74	F
FINAL EXAM 30%	✓ Exceptional course content knowledge & understanding	90 – 100	A
	✓ Good course content knowledge & understanding	80 – 89	B
	✓ Average course content knowledge & understanding	75 – 79	C
	✓ Insufficient unit content knowledge & understanding	0 – 74	F

Course Grade: A	90 – 100
B	80 – 89
C	75 – 79
F	0 – 74

A grade average of C (75) must be maintained in all RADR classes. Failure to do so will result in the student being dropped from the Program.

Major Exams – 70% (4 exams, each worth 17.5%)

Major exams will be given throughout the semester following each module presented. Exams will be multiple choice and will be done electronically in the computer lab.

The following guidelines will be followed regarding **Major Exams**:

1. The student will complete the exam at the scheduled time.
2. The student must complete the exam within the allotted class time of **2 hours**.
3. There will be **NO** make-up exams.
4. If a test must be missed, the weight of the final exam will be increased.
5. A student arriving late for an exam will not be allowed to take the exam if **any** student has completed the exam and left the room. This will also count as a tardy.
6. No cell phones or other electronic assistance, other than calculators, are allowed during exams.

7. According to SPC policy, **student's grade will not be given over the phone or by email to avoid the risk of a breach of confidentiality.**

Final Exam – 30%

A comprehensive final exam will be given at the end of the semester. Two hours will be allotted for the final exam consisting of multiple choice questions and will be done electronically in the computer lab.

The following guidelines will be followed regarding the **Final Exam**:

1. The final exam will be comprehensive.
2. The final exam must be completed within the allotted time, **2 hours**.
3. A student arriving late for an exam will not be allowed to take the final exam if **any** student has completed the exam and left the room.
4. No cell phones or other electronic assistance, other than calculators, are allowed during exams.
5. If a student is unable to take the final exam at the assigned time for any reason, the student may be given an incomplete for the course.
6. According to SPC policy, **the student's grade will not be given over the phone or by email to avoid the risk of a breach of confidentiality.**

COMMUNICATION POLICY

Electronic communication between instructor and students in this course will utilize the South Plains College "My SPC" email system and Remind[®]. Instructor will not initiate communication using private email accounts. Students are encouraged to check SPC email on a regular basis.

STUDENT CONDUCT

Students in this class are expected to abide by the standards of student conduct as defined in the SPC Student Guide and the Radiologic Technology Program Student Handbook.

CELL PHONES

Cell phones are to be turned OFF during scheduled class/lab periods, unless prior approval has been given from the instructor. **THIS INCLUDES TEXT MESSAGING.** Cell phones are to be used outside the classroom only.

Students will be dismissed from class/lab and sent home if a phone continuously rings/vibrates or if the student is discovered texting. The student will receive an absence for the class. The phone number to the front desk is (806)716-4622 for emergencies.

ACCOMMODATIONS

Disabilities Statement

Students with disabilities, including but not limited to physical, psychiatric, or learning disabilities, who wish to request accommodations in this class should notify the Disability Services Office early in the semester so that the appropriate arrangements may be made. In accordance with federal law, a student requesting accommodations must provide acceptable documentation of his/her disability to the Disability Services Office. For more information, call or visit the Disability Services Office at Levelland (Student Health & Wellness Office) 806-716-2577, Reese Center (Building 8) 806-716-4675, or Plainview Center (Main Office) 806-716-4302 or 806-296-9611.

Diversity Statement

In this class, the teacher will establish and support an environment that values and nurtures individual and group differences and encourages engagement and interaction. Understanding and respecting multiple experiences and

perspectives will serve to challenge and stimulate all of us to learn about others, about the larger world and about ourselves. By promoting diversity and intellectual exchange, we will not only mirror society as it is, but also model society as it should and can be.

COURSE OUTLINE

Essential Concepts of Radiologic Science

The student will:

1. Identify major events in the discovery and advancement of x-ray imaging.
2. Identify the characteristics of matter and energy.
3. Identify the types of energy applicable to radiography.
 - Potential
 - Kinetic
 - Electrical
 - Thermal
4. Describe the use of time, distance and shielding for effective radiation protection. (F8, F9; C18, C19)
5. Use the radiologic units of measure.
 - Exposure: Roentgen ($\text{Gray}_{\text{kerma}}$)
 - Absorbed dose: RAD ($\text{Gray}_{\text{tissue}}$)
 - Dose Equivalent: REM (Seivert)
 - Radioactivity: Curie (Becquerel)
6. Identify the basic particles of an atom: proton, neutron & electron.
7. Define atomic number and atomic mass number.
8. Describe binding energy as it applies to the atom's electron(s). (F10)
9. Identify the types of ionizing radiation.
10. Identify the principle particulate radiations: *alpha* particle, *positron* and *beta* particle.
11. Differentiate between electromagnetic and particulate radiation.

Text Assignment: Bushong, Ch. 1

Structure of Matter

The student will:

1. Relate the history of the atom.
2. Identify the structure of the atom.
3. Describe electron shells and instability with atomic structure.
4. Discuss radioactivity and the characteristics of alpha and beta particles.
5. Explain the difference between two forms of ionizing radiation: particulate and electromagnetic.

Text Assignment: Bushong, Ch. 2

Electromagnetic Energy

The student will:

6. Define *photon*.
7. Identify the properties of electromagnetic (EM) photons, their relationship and how they affect interactions with matter. (F10, F12)
 - Velocity
 - Wavelength
 - Frequency
 - Energy
8. Identify the *speed of light*.
9. Calculate photon wavelength or frequency ($v = f\lambda$). (F4)
10. Identify the content of the *electromagnetic spectrum* and their arrangement pertinent to radiography.
 - Visible light, infrared light, ultraviolet light
 - Radiofrequency
 - Ionizing radiation
11. Differentiate between *x-radiation* and *gamma radiation*. (F12)
12. Explain the *wave-particle duality* of radiation. (F12)
13. Define the *Inverse Square Law*. (F12)
 - $I_1/I_2 = (d_2/d_1)^2$ (F4)
 - Inverse relationship with radiation intensity
14. Calculate radiation intensity using the Inverse Square Law formula. (F4)
15. Explain *ionization*.

Text Assignment: Bushong, Ch. 3

X-ray Tube

The student will:

1. Describe the general design of an x-ray tube.
2. List the external components that house and protect the x-ray tube.
3. Identify the purpose of the glass or metal enclosure.
4. Discuss the cathode and filament currents.
5. Describe the parts of the anode and the induction motor.
6. Define the line-focus principle and the heel effect.
7. Identify the three causes of x-ray tube failure.
8. Explain and interpret x-ray tube rating charts.

Text Assignment: Bushong, Ch. 6

X-Ray Production

The student will:

1. Explain *thermionic emission*, *space charge* and *tube current*. (F10, C15)
2. Explain *heat production* and the factors that affect it. (F10; C15)
3. Explain *characteristic x-ray* production and the factors that affect it. (F10; C15)
4. Explain *bremstrahlung x-ray* production and the factors that affect it. (F10; C15)
5. Identify the x-ray technical factors: milliamperage-seconds (mAs), kilovoltage-peak (kVp), filtration and source-to-image distance (SID) and explain their importance in x-ray production & emission.
6. Describe primary *x-ray beam quantity* and the effects of mAs, kVp, filtration and SID. (F10; C15)

7. Describe primary *x-ray beam quality* and the effects of kVp and filtration. (F10; C15)
8. Identify the information contained in a *continuous x-ray spectrum* and a *discrete x-ray spectrum*.
9. Anticipate how a change in any given technical factor will affect both forms of x-ray production. (F8, F9, F10, F12; C15)

Text Assignment: Bushong, Ch. 7

X-ray Emission

The student will:

1. Define *x-ray beam quantity* and relate it to x-ray intensity. (C15)
2. List and explain the technical factors that affect x-ray beam intensity: mAs, kVp, filtration, SID.
3. Use the *Square Law* to calculate a necessary mAs change when SID is altered. (F4, F12; C15)
 - $mAs_1/mAs_2 = (SID_1/SID_2)^2$
4. Define *x-ray beam quality (energy)* and relate it to x-ray penetration. (F12; C15)
5. List and explain the technical factors that affect x-ray beam quality: kVp, filtration and half-value layer (HVL).
6. Differentiate between the various types of filtration: inherent, added and compensating.

Text Assignment: Bushong, Ch. 8

X-ray Interaction with Matter

The student will:

1. Explain a *coherent (classical)* EM photon and matter interaction, including production, energy and effects. (F8, F10; C15)
2. Explain a *Compton* EM photon and matter interaction, including production, energy and effects. (F8, F10; C15)
3. Explain a *photoelectric* EM photon and matter interaction, including production, energy and effects. (F8, F10; C15)
4. Explain *pair production* and why it does not occur in diagnostic radiography. (F8, F10; C15)
5. Explain *photodisintegration* and why it does not occur in diagnostic radiography. (F8, F10; C15)
6. Explain why Compton and photoelectric interactions are important in radiologic technology. (F8, F10; C15)
7. Identify the interactions involved in differential absorption. (F10; C15)
8. Explain *differential absorption* in radiographic imaging. (F10)
9. Identify the factors that control and influence differential absorption. (C15)
10. Explain radiographic exponential attenuation of x-rays by matter. (F10)
11. Identify the components of the *remnant (exit) x-ray beam*.
12. Define *radiographic exposure*.
13. Describe the process of radiographic image formation. (F8, F10; C15)
 - Differential absorption
 - Beam attenuation
 - Scattering
 - Transmission

Text Assignment: Bushong, Ch. 9

Radiographic Image Quality

The student will:

1. Identify and define the properties that result in *visibility of detail*. (F10)

- Optical density
 - Contrast
2. Identify and define the properties of short scales of high contrast. (F10)
 3. Identify and define the properties of long scales of low contrast. (F10)
 4. Differentiate between **radiographic contrast** and **subject contrast**. (C15)
 5. Identify the effects of the primary radiographic technical factors on *visibility of detail*. (F12)
 - kVp
 - mAs = mA x exposure time
 - SID
 - Image receptor properties
 6. Identify the effect of *scatter radiation* on the radiographic image. (F8, F9, F10)
 7. Identify and define the properties that result in diagnostic **recorded detail**. (F10)
 8. Identify the radiographic geometric properties that affect recorded detail. (F10)
 - Focal spot size
 - SID
 - OID
 9. Identify the key factors in producing the most diagnostic recorded detail.
 10. Define radiographic distortion. (F10)
 11. Differentiate between *radiographic size distortion* and *radiographic shape distortion*. (C15)
 12. Identify and explain the effects of the components of **radiographic exposure technique**.
 - **Primary technical factors:** mAs, kVp
 - **Secondary technical factors:** focal spot size, SID, OID, beam restriction, filters, grids, x-ray generators, central ray (CR) alignment.

Text Assignment: Bushong, Ch. 10

Control of Scatter Radiation

The student will:

1. Identify the x-rays that constitute image-forming radiation.
2. Recognize the relationship between scatter radiation and image contrast.
3. List three factors that contribute to scatter radiation.
4. Discuss three devices developed to minimize scatter radiation.
5. Describe beam restriction and its effect on patient radiation dose and image quality.
6. Describe grid constructions and its measures of performance.
7. Evaluate the use of various grids in relation to patient dose.

Text Assignment: Bushong, Ch. 11

FOUNDATION SKILLS

BASIC SKILLS—Reads, Writes, Performs Arithmetic and Mathematical Operations, Listens and Speaks

F-1 Reading—locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.

F-2 Writing—communicates thoughts, ideas, information and messages in writing and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.

F-3 Arithmetic—performs basic computations; uses basic numerical concepts such as whole numbers, etc.

F-4 Mathematics—approaches practical problems by choosing appropriately from a variety of mathematical techniques.

F-5 Listening—receives, attends to, interprets, and responds to verbal messages and other cues.

F-6 Speaking—organizes ideas and communicates orally.

THINKING SKILLS—Thinks Creatively, Makes Decisions, Solves Problems, Visualizes and Knows How to Learn and Reason

F-7 Creative Thinking—generates new ideas.

F-8 Decision-Making—specifies goals and constraints, generates alternatives, considers risks, evaluates and chooses best alternative.

F-9 Problem Solving—recognizes problems, devises and implements plan of action.

F-10 Seeing Things in the Mind’s Eye—organizes and processes symbols, pictures, graphs, objects, and other information.

F-11 Knowing How to Learn—uses efficient learning techniques to acquire and apply new knowledge and skills.

F-12 Reasoning—discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

PERSONAL QUALITIES—Displays Responsibility, Self-Esteem, Sociability, Self-Management, Integrity and Honesty

F-13 Responsibility—exerts a high level of effort and perseveres towards goal attainment.

F-14 Self-Esteem—believes in own self-worth and maintains a positive view of self.

F-15 Sociability—demonstrates understanding, friendliness, adaptability, empathy and politeness in group settings.

F-16 Self-Management—assesses self accurately, sets personal goals, monitors progress and exhibits self-control.

F-17 Integrity/Honesty—chooses ethical courses of action.

SCANS COMPETENCIES

C-1 **TIME** - Selects goal - relevant activities, ranks them, allocates time, prepares and follows schedules.

C-2 **MONEY** - Uses or prepares budgets, makes forecasts, keeps records and makes adjustments to meet objectives.

C-3 **MATERIALS AND FACILITIES** - Acquires, stores, allocates, and uses materials or space efficiently.

C-4 **HUMAN RESOURCES** - Assesses skills and distributes work accordingly, evaluates performances and provides feedback.

INFORMATION - Acquires and Uses Information

C-5 Acquires and evaluates information.

C-6 Organizes and maintains information.

C-7 Interprets and communicates information.

C-8 Uses computers to process information.

INTERPERSONAL—Works With Others

C-9 Participates as a member of a team and contributes to group effort.

C-10 Teaches others new skills.

C-11 Serves Clients/Customers—works to satisfy customer’s expectations.

C-12 Exercises Leadership—communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.

C-13 Negotiates—works toward agreements involving exchanges of resources; resolves divergent interests.

C-14 Works With Diversity—works well with men and women from diverse backgrounds.

SYSTEMS—Understands Complex Interrelationships

C-15 Understands Systems—knows how social, organizational, and technological systems work and operates effectively with them.

C-16 Monitors and Corrects Performance—distinguishes trends, predicts impacts on system operations, diagnoses systems performance and corrects malfunctions.

C-17 Improves or Designs Systems—suggests modifications to existing systems and develops new or alternative systems to improve performance.

TECHNOLOGY—Works with a Variety of Technologies

C-18 Selects Technology—chooses procedures, tools, or equipment, including computers and related technologies.

C-19 Applies Technology to Task—understands overall intent and proper procedures for setup and operation of equipment.

C-20 Maintains and Troubleshoots Equipment—prevents, identifies, or solves problems with equipment, including computers and other technologies.



I _____ have received a copy of the RADR 1213 course syllabus. I have read and understand the contents of this syllabus.

Signature

Date