

TEXAS CHIROPRACTIC COLLEGE SUMMER 2010 TRIMESTER

COURSE NUMBER AND NAME: PHYSICS PRINCIPLES OF DIAGNOSTIC IMAGING

**COURSE MEETING – DAYS / TIME: MONDAY 2-3PM
FRIDAY 11AM-12PM**

COURSE MEETING PLACE: LRC 205

COURSE HOURS: 2 LECTURE HOURS

COURSE CREDITS: 2

COURSE INSTRUCTOR: JEFFREY R. THOMPSON, DC

CONTACT INFORMATION: OFFICE PHONE- (281) 998-6071 JTHOMPSON@TXCHIRO.EDU

OFFICE NUMBER AND BUILDING: SMITH BLDG.

**OFFICE HOURS – DAYS / TIME: Monday 3-4pm Friday 1-2pm
Wednesday 1-2pm Thursday 9-10am**

Website: Scholar 360 Address: <http://scholar360.com/txchiro>

SCHEDULING FOR APPOINTMENTS DURING OFFICE HOURS CAN BE ARRANGED WITH DR. THOMPSON OR WITH MS. PAM VISE, COORDINATING SECRETARY FOR ACADEMICS (EXT 6056)

COURSE MATERIALS

REQUIRED TEXTS:

- **BUSHONG, SC: RADIOLOGIC SCIENCE FOR TECHNOLOGISTS: PHYSICIS, BIOLOGY AND PROTECTION MOSBY PUBLISHERS (CURRENT EDITION – 9TH), PUB. 2009.**

OTHER REFERENCES:

- **TEXAS DEPARTMENT OF HEALTH, BUREAU OF RADIATION CONTROL: TEXAS REGULATIONS FOR CONTROL OF RADIATION TRCR 289.227 AND 289.231.**

COURSE DESCRIPTION

This course is designed to give the chiropractic student a clinical working knowledge of the physics, radiobiology, technical principles and issues of radiation safety/protection pertaining to the use of ionizing radiation in plain film diagnostic imaging.

LEARNING OUTCOMES

- ❖ The student will recognize the components of an x-ray imaging system .
- ❖ The student will be able to recognize and describe the interaction of important physical principles that are at work in the production and the use of x- rays for diagnostic imaging.
- ❖ The student will understand how the principles of x- ray physics and radiation safety are applied during the operation of x-ray imaging devices to achieve the best image quality at the lowest patient dose.
- ❖ The student will appreciate the importance and application of safety procedures in the utilization of ionizing radiation.

LEARNING OBJECTIVES: THE STUDENT WILL BE ABLE TO -

- ❖ Describe necessary steps to avoid common technical errors in x-ray exposure technique selection and equipment handling
- ❖ Demonstrate the ability to recall and identify operator controlled variables of diagnostic x- ray imaging.
- ❖ Identify resulting image quality effects that occur in response to changes in operator controlled x-ray exposure variables.
- ❖ Identify the physical principles of x- ray production for the purposes of diagnostic imaging.
- ❖ Identify and explain the affects that ionizing radiation has on living tissues/organisms and the attendant risks involved in the use of ionizing radiation for diagnostic imaging.
- ❖ To explain the interactions between functional components of a diagnostic x- ray machine and recognize the role that each plays in the safe utilization of diagnostic x- ray.
- ❖ To demonstrate understanding of radiobiology and radiation safety principles and the application of these principles in the safe operation of plain film x- ray imaging devices.
- ❖ To analyze the principles and effects of x- ray technique variables, film exposure and processing procedures in the production of quality x- ray images.

CCE COMPETENCIES

- ❖ The following CCE competencies are addressed in this course:
 - Neuromusculoskeletal examination.
 - Diagnostic Studies: .

TEACHING PHILOSOPHY:

- ❖ Lectures for Principles of X-ray Physics will be a didactic presentation of PowerPoint lectures and Scholar 360 information with regular classroom opportunity for questions and discussion. The course material will closely follow that found in the required text. It is expected that the student will both review the class notes and carefully read those related topics in the textbook to assure complete understanding of the material. This will prepare the student to understand and participate in a brief question/answer review at the beginning of each class that will cover the previously presented material.

Student Responsibilities

The student is expected to keep current on their understanding of course material, reviewing notes from the previous class and reading related areas in the course textbook. Participation in a brief question/answer review of earlier material at the beginning of the class is expected. The student is expected to read and review this syllabus for additional information on responsibilities. Regular attendance and attention are expected.

Topical Sequence Guideline - X-ray Physics Principles

Chapters listed below are from required text Radiologic Science for Technologists 9th edition

NOTE: this is not a comprehensive topical list of all material covered in this class; this guideline will, however, assist the student in coordinating material presented in lectures with corresponding topics in the text. Both the sequence and content are subject to modification during the trimester. It remains the responsibility of the student to coordinate textbook reading with topical presentations in class.

1. WEEK 1 : Chapt 1 – 3 (Review and history)
 - a. Historical perspective
 - b. Basic physics review
 - c. Special units of radiation quantification
 - d. Atomic structure
 - e. Ionization
2. WEEK 2 : Chapt 4 -5
 - a. Electromagnetic radiation
 - b. X-ray properties, terminology
 - c. Electricity- units and principles
3. WEEK 3 : Chapt 6 – 7
 - a. X-ray machine- components
 - b. X-ray tube construction
4. WEEK 4 : Chapt 8-9 (some
 - a. X-ray beam production
 - b. X-ray beam spectrum, attenuation and HVL
5. WEEK 5: Chapt 15 Radiographic Technique
6. WEEK 6: Chapt 10-11
 - a. X-ray interactions with matter
 - b. X-ray film
7. WEEK 7: Chapt 12-13
 - a. X-ray film processing
 - b. X-ray screens
8. WEEK 8: Chapt 14
 - a. Control of scatter- grids
 - i. **MIDTERM EXAM** – tentative schedule--exact date to be determined
9. WEEK 9: Chapt 16, 32-33
 - a. Image Quality
 - b. Biology review
10. WEEK 10 : Chapt 33 -35
 - a. Radiobiology
 - b. Radiation exposure- Acute (early) effects
11. WEEK 11 Chapt 35- 36
 - a. Radiation exposure- Chronic (late) effects

midterm exams must be completed as per college policy (see paragraph below). Make-up exams may be given in an essay style format.

➤ Make-up policy is in accordance with TCC policy, abbreviated below (for complete statement, see TCC Make-up Exam Policy as revised May 27, 2009 and cabinet approved July 2009)

➤ Missed exam Policy (abbreviated):

Students must notify faculty before missing any examination. If an examination is missed for good and sufficient reason and the student has notified the faculty member in advance, a make-up examination may be given, subject to a minimum fee of \$40.00. The fee for the make-up examination is a minimum of \$75.00 if a standardized patient is required for the exam. Additional required standardized patient hours may increase this \$75.00 minimum fee. All intra-term examinations must be made up prior to final examinations. Missed final examination must be made up within the first week of the next trimester. A student may be allowed a maximum of two missed examination dates for good and sufficient reason per trimester. These two missed examination dates are for all enrolled courses in a trimester, not for each individual course. Any request for additional make-up examinations will require documentation substantiating the absence and must be approved by the Dean of Academic Affairs. Forms for requesting make-up exams and procedures for payment are available thru the faculty secretary offices. Students that are late for an exam may have to take a make-up examination, especially if students have already exited the said exam.

❖ **REVIEW OF EXAMINATIONS:**

- Students may review their examinations by appointment with the instructor. Scheduling is best accomplished directly with the instructor (email or before/after class), however the faculty secretary (Ms. Pam Vise) can also be contacted in the Smith Bldg. for assistance in scheduling.
- **Exams must be reviewed within 2 weeks (10 working days) of the time the grades are posted for that exam.** In the case of the final exam, the student may review the exam after finals week during the break (pending instructor schedule) or the first two weeks of the next trimester.

❖ **ACADEMIC DISHONESTY:** Academic integrity is expected at all times, as per college policy. Refer to the student handbook for more information. Be aware that any “old exams” from this class are stolen material and you may be subject to academic discipline or dismissal if found in possession.

❖ **USE OF ELECTRONIC DEVICES:**

- THE OPPORTUNITY TO USE ELECTRONIC DEVICES IN THE CLASSROOM CAN BE SUSPENDED IF A STUDENT IS IN VIOLATION OF THIS POLICY.
- NO ELECTRONIC DEVICES MAY BE USED DURING ANY FORM OF EXAMINATION OR ASSESSMENT.
- DISTRACTING OR DISRUPTIVE USE OF ANY ELECTRONIC DEVICE IS NOT PERMITTED DURING CLASS PERIODS.
 - Distracting or disruptive use will include but not be limited to examples below.
 - Cell phones: students may not use their cell phones during classes or exams- not for calls, not for texting, not for light, not for pictures, not for anything. If you are expecting an important call during a class (not an exam), put your phone on silent alarm, sit near the door

and step outside the classroom to take the call. You may (quietly) re-enter the classroom after you finish the call.

- Personal computers: you may use your computer to take notes during class. Computers will be off during examinations. You may not use it for any form of personal communication during class

➤ TCC COMPUTERS:

- You may not use the computers in the labs for any other purposes than those to which you are specifically directed by the instructor
- You may not use them for any form of personal communication during class; you may not use them to check your email;
- You may not use them for any form of entertainment, including but not limited to u-tube, videos, movies or general web-surfing.
- You may not upload or download anything to/from these computers without the specific instruction or permission of an instructor.

- Other devices: the use of any other electronic recording or communication device in the classroom must be specifically approved by the instructor.

❖ **TUTORING:** As per college policy. Refer to the student handbook for more information.

❖ **LEARNING DISABILITIES/IMPAIRMENTS:**

- Those students who may require additional time or other special accommodations for testing due to learning disability must contact the TCC Counseling Dept. **at the beginning of the trimester** in order to allow sufficient time for arrangements to be made. The presence of a disability (diagnosis alone is insufficient) must be confirmed by the Counseling Dept. before any modification of standard testing protocols/procedures will be offered.
- To ensure the validity of any request, no accommodation for special testing circumstances will be made without prior review and recommendation from the counseling department of TCC. Texas Chiropractic College policy is designed to comply with the ADA and Section 504 as well as the guidelines outlined by the Association on Higher Education and Disability (AHEAD).

NB: THE INSTRUCTOR RESERVES THE RIGHT TO MAKE CHANGES TO THIS SYLLABUS DURING THE TRIMESTER.