

LANCASTER GENERAL COLLEGE OF NURSING AND HEALTH SCIENCES
Cardiovascular Invasive Specialty Program

CIS 235 SYLLABUS

- I. Title: CIS 235 Radiology/Electrophysiology
- II. Course Description: This course is designed for students to gain knowledge in x-ray imaging, arrhythmia management devices, electrophysiology (EP). The student will experience more in-depth diagnostic and interventional clinical practice in the cardiac catheterization laboratory in the areas of circulating, scrubbing, recording, pre and post procedure care and manipulating imaging equipment during the catheterization procedure.
- III. Prerequisite: CIS 210 Cardiology Lab/Clinical
- IV. Co Requisite: CIS 240 Cardiovascular Pharmacology
- V. Placement: Spring Term
- VI. Time Allotment: Theory 45 hours
- VII. Faculty: Robin Harclerode, M.Ed, RT(R)
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- VIII. Credits: Three (3)
- IX. Evaluation: A. Theory Grade

<u>Instrument</u>	<u>Weight</u>	<u>Time/Date</u>
Unit Exams	90%	Weeks 6, 12 finals wk
Class Participation/Projects	10%	Weeks 1-15

***A grade of "C" (2.0) is required to pass the theory portion of the course.**

- X. Textbooks: Grossman, W. & Baim, D. (2000). Cardiac Catheterization Angiography & Intervention. (6th ed.). Baltimore: Williams & Wilkins.
- Bushong, Stewart C. (1998). Radiologic Science for Technologists (6th ed). St. Louis Mosby Company.

XI. Course Objectives: Given the theoretical experience, at the completion of this course, the student will:

1. Apply the principles and effects of radiographic imaging.
2. Identify the indications and usage of cardiac devices.
3. Identify the indications and usage of EP procedures.

XII. Program Policies: Students are held accountable for all policies in the Student Handbook and any revisions made to those policies during the academic year.

XIII. Procedures and Policies:

A. Importance of Attending Class

Cardiovascular education comprises more than just private reading and passing of exams. Students should recognize that active and informed participation in class is essential to the development of their intellectual abilities and scholarly growth. Students must also recognize the importance, for both the present and the future, of achieving an academic record that reflects their intellectual ability. Such records are seldom achieved without regular attendance and participation in class activities. Attendance will be taken.

B. Student Responsibility for Missed Material

Students are responsible for all material presented and announcements made in class, regardless of attendance. It is the student's responsibility to obtain materials and assignments if absent.

C. Unit Examinations

Examinations should only be missed in extenuating circumstances. A student who misses an examination will be required to make up the examination on the next day of lecture. Contact the instructor, prior to the next lecture day to make arrangements to take the exam.

A student who misses an examination, regardless of the reason, will have ten percent (10%) deducted from the grade achieved on the exam. Example: The exam is worth sixty (60) points, the student takes the exam and achieves a grade of 52/60. The score of 52 is then decreased by ten percent (10%) or five (5) points, thus the grade on the exam will be 47/60. An alternate examination may be given for the make-up examination.

D. Class Behavior

Once class has started, the instructor has the prerogative not to admit students into lecture. Students will be dismissed from class for any inappropriate behavior. Failure to be in class on time will affect the class participation portion of your final grade.

E. Student Responsibility for Missed Material

Students are responsible for all material presented and announcements made in the clinical area, regardless of attendance. It is the student's responsibility to obtain materials and assignments if absent.

F. Written Assignments

All submitted written work must follow the *Publication Manual of the American Psychological Association* (5th ed.) unless directed otherwise by the course instructor.

G. Academic Dishonesty and Plagiarism

Academic dishonesty violates the spirit and purpose of an academic community, and is therefore subject to disciplinary action. Academic dishonesty includes cheating on examinations and unauthorized duplication of work.

Plagiarism is an act of academic dishonesty. Any work submitted that is not your own is an act of plagiarism. In preparing assignments, you must acknowledge in writing, any use of outside sources or any assistance you received in preparing an assignment. All written work must be submitted adhering to LGCNHS guidelines.

If an instructor believes that a student has committed an act of academic dishonesty or has plagiarized material, the instructor may award a failing grade for that assignment to the student. If the occurrence is during an examination, the student will receive a zero for that portion of their grade and must leave the room.

If the student disagrees with this decision, the student may follow the grievance procedure.

XIV. Revisions:

This syllabus is subject to revision by the faculty at any time.

CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE
Unit #1			
I. Overview of the radiographic imaging system.	2	Reference reading: none Classroom Activities: Lecture, transparencies	1,2
II. Principles of diagnostic imaging A. Properties of matter and energy B. Properties of ionizing radiation C. Imaging and recording media	2	Reference reading: Topical outline Bushong Chapter(s) 1 Classroom Activities: Lecture, transparencies, examine grey scale images	2
III. Components of the x-ray (fluoroscopic tube) A. Cathode B. Anode C. Glass envelope D. Tube housing	4	Reference reading: Topical outline Bushong . Chapter(s) 3, 9, 10, 21 Classroom Activities: Lecture, transparencies, examination of x-ray tubes and their	1,2
IV. Fluoroscopy-Image Production A. Differential absorption B. Fluoroscopic tube C. Image intensifier D. CRT operation E. Image degradation	3	Reference reading: Bushong. Chapter 25 Classroom Activities: Lecture, overhead transparencies	1,2
IV. The radiographic image A. Photographic density B. Photographic contrast C. Radiographic detail D. Magnification (size) distortion E. Characteristic curve	4	Reference reading: Bushong . Chapter(s) 3, 9, 10, 21 Classroom Activities: Lecture, transparencies, examination of images, large group activity - plot H&D curve, large group discussion – results of H& D curve plotting.	1,2

CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE
V. Units of measurement A. SI units B. Metric units C. British units Unit #2	1	Reference reading: none Classroom Activities: Lecture, transparencies, small group activity, measuring devices and measurement conversions	3 3
VI. Atomic structure A. Atom B. Molecule C. Compound D. Bonding E. electron binding energy	4	Reference reading: Topical outline Bushong, Chapter 4 Classroom Activities: Lecture, transparencies, small group discussion	1,2
VII. Radioactivity A. Alpha decay B. Beta decay C. Gamma decay D. Radioactive half-life	4	Reference reading: Topical outline Classroom Activities: Lecture, transparencies, small group discussion	4
VIII. Electromagnetic radiation A. Electromagnetic spectrum B. Quantum theory C. Mass-energy relationship	4	Reference reading: Topical outline Bushong, Chapter 5 Classroom Activities/Assignments: Lecture, transparencies, complete mass-energy worksheets	4
IX. Electrostatics A. Charge B. Electrification C. Conductors D. Insulators E. Semi-conductors	4	Reference reading: Topical outline Bushong, Chapter 6 Classroom Activities/Assignments: Lecture, transparencies,	4
X. Electrical circuits A. series circuits B. parallel circuits C. Ohm's law	4	Reference reading: Topical outline Bushong. Unit 6 Classroom Activities/Assignment: Lecture, overhead transparencies, complete electrical circuit worksheets	

CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE
XI. Electrical generation A. Magnetic principles B. Generators C. Motors D. Solenoid E. Waveforms F. Rectification G. Transformers	4	Reference reading: Topical outline Bushong. Chapters 7,8 Classroom Activities: Lecture, overhead transparencies	1,2
XII. Radiation protection A. Roentgen B. RAD C. REM D. MPD E. ALARA F. Cardinal Principles of Protection G. Inverse square law H. Isodose curves	4	Reference reading: Topical outline Bushong. Chapter(s) 2, 38 Classroom Activities: Lecture, overhead transparencies	5
XIII. Radiation biology A. Cellular components B. Cell proliferation life cycles C. Radiosensitivity D. Fractionalization E. Protraction F. Dose response curves G. Target Theory	4	Reference reading: Topical outline Bushong. Chapter(s) 33,34 Classroom Activities: Lecture, overhead transparencies	6
XIV. Radiation Monitoring A. Devices B. MPD's C. Exposed dose versus absorbed dose D. Exposure bank E. Exposure records	4	Reference reading: Topical outline Bushong. Chapter 39 Classroom Activities: Lecture, overhead transparencies	5

CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE
Unit #3			
IX. Arrhythmia Management Devices A. Permanent pacemaker B. Implantable cardiac defibrillator	4	Reference reading: Handouts Classroom Activities:	7
X. Electrophysiology Concepts A. Indications B. Types of studies C. Ablations	4	Lecture, overhead transparencies	8

Class date, time and location	Material	Assignment
<p>Class #1 1/8/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>Overview of the radiographic imaging system. Terminology Properties of matter and energy Properties of ionizing radiation Tissue interactions (Brems, Photoelectric and Compton) Absorption, penetration and attenuation, Recording media, image storage, retrieval and transfer (Cath labs)</p>	<p>Recommended readings/assignments: Topical outline Classroom Activities: Lecture, transparencies</p>
<p>Class #2 1/15/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>Components of the x-ray (fluoroscopic tube) Cathode Anode Glass envelope Tube housing Image production (tissue densities, contrast media) Optical projection and corresponding body part densities on digital images Fluoroscopy Components of the II system Gains, quantum mottle Radiation safety; dose limitations Pulsed vs. continuous fluoro</p>	<p>Recommended readings/assignments: Topical outline Bushong . Chapter(s) 1 Classroom Activities: Lecture, transparencies, examine grey scale images Examine example of an x-ray tube</p>
<p>Class #3 1/22/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>Cathode ray tube (CRT) Components, structure and function Image degradation, loss of detail and resolution Radiation dose for fluoroscopy versus diagnostic radiology The radiographic image Photographic density Photographic contrast Radiographic detail Photographic properties of the grey scale Magnification (size) distortion Sensitometry, characteristic curve and QC testing</p>	<p>Recommended readings/assignments: Topical outline Bushong . Chapter(s) 3, 9, 10, 21 Classroom Activities: Lecture, transparencies, examination of radiographic images, Large group activity - plot H&D curve, Large group discussion – results of H& D curve plotting.</p>

Class date, time and location	Material	Assignment
Class #4 1/29/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	Photons, exposure, dose and the image Prime Factors and image characteristics and image integrity Scatter and secondary (s/s); effects on the image and radiation worker exposure Units of measurement SI units Metric units British units Velocity Volume Special quantities	Recommended readings: Topical outline Bushong, Chapter 4 Classroom Activities: Lecture. Examine images affected by s/s radiation Perform conversion problems from SI to metric
Class #5 2/5/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	Atomic structure Atom Molecule Compound Bonding electron binding energy Radioactivity Alpha decay Beta decay Gamma decay Radioactive half-life Electromagnetic radiation Quantum theory Mass-energy relationship Electromagnetic spectrum Frequency, wavelength and energy Wave particle duality	Recommended readings: Topical outline Bushong, Chapters 5 and 6 Classroom Activities/Assignments: Lecture, transparencies, complete mass-energy worksheets

Class date, time and location	Material	Assignment
<p>Class #6 2/12/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>TEST</p> <p>Electrostatics Charge Electrification Conductors Insulators Semi-conductors</p> <p>Electrical components Resistors Capacitors Switch Power source Variable resistors/rheostats</p> <p>Electrical circuits series circuits parallel circuits Ohm's law</p>	<p>Classroom Activities/Assignments:</p> <p>Topical outline Lecture, transparencies. Complete electric circuit worksheets</p>
<p>Class #7 2/19/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>Electrical generation Magnetic principles Generators Motors Solenoid Waveforms Rectification Transformers</p>	<p>Recommended readings:</p> <p>Topical outline Bushong, Chapters 7 and 8</p>
<p>Class #8 2/26/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205</p>	<p>Radiation protection Roentgen RAD REM MPD ALARA Cardinal Principles of Protection Inverse square law Isodose curves</p>	<p>Recommended readings:</p> <p>Topical outline Bushong, Chapters 1 and 2</p>

Class date, time and location	Material	Assignment
Class #9 3/5/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	Radiation biology Cellular components Cell proliferation life cycles Radiosensitivity (organs and tissues) Fractionalization Protraction Dose response curves Target Theory	Recommended readings: Topical outline Bushong, Chapter 35
3/12/06	Spring Break – No Classes	
Class #10 3/19/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	Radiation Monitoring Devices MPD's Exposed dose versus absorbed dose Exposure bank Exposure records	Recommended readings: Topical outline Bushong, Chapter 37
Class #11 3/26/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	Review Video “K-19” and “Magnets” Discuss, batteries, electrical circuits, generators, motors, radiation doses and responses seen in the videos	Recommended readings: Topical outline
Class #12 4/02/07 13:00 - 16:00 hrs. Mr. Harclerode CR 205	TEST	
Class #13 04/9/07 13:00 - 16:00 hrs. Doug Willwerth CR 205	Arrhythmia Management Devices Permanent pacemaker Implantable cardiac defibrillator	handouts
Class #14 4/16/07 13:00 - 16:00 hrs. Sue Deck CR 205	Electrophysiology concepts Indications Types of Studies	handouts
Class #15 4/23/07 13:00 - 16:00 hrs. Sue Deck CR 205	Electrophysiology concepts Invasive therapeutic procedures and approaches Ablations	handouts
Final Exam week	Unit test	