Master Syllabus
MRIT 2276
Principles of Magnetic Resonance Physics and Procedures
Semester:
Course Dates:

Course Time/Location

Faculty Name
Office hours:
Office Location:
Telephone Number:
Email:

Arranging for conferences/appointments
In the event that you need additional course information or would like to meet with the faculty member, please contact the faculty member via email and make an appointment during the designated office hours.

Course Description
This course is designed to study the data acquisition process and expound upon specific pulse sequences. Imaging protocols of the major body regions will be described and special studies such as Magnetic Resonance Angiography will be discussed and demonstrated. (2-2-0)

Required Textbook
Magnetic Resonance Imaging: Physical and Biological Principles, Stewart C. Bushong, 3rd Edition, ISBN-13:9780323014854, PUB. DATE: April 2003, PUBLISHER: Elsevier Health Sciences

Course Prerequisites
MRIT 2230 or Department Chair Approval.

Scans Competencies
In 1990, the U.S. Department of Labor established the Secretary's Commission on Achieving necessary Skills (SCANS) to examine the demands of the workplace and whether our nation's students are capable of meeting those demands. The Commission determined that today's jobs generally require competencies in the following areas:

- Resources: identified, organizes, plans, and allocates resources
- Interpersonal: Works well with others
- Information: Acquires and uses information
- Systems: Understands complex interrelationships
- Technology: Works with a variety of technologies

Resources: Identifies, organizes, plans, and allocates resources.
- Time: Selects goal relevant activities, ranks them, allocates time, and prepares schedule to complete activity.

Interpersonal: Works with others.
- Participates as a team member. Contributes to group effort (group assignment), Works with diversity-works well with everyone from diverse backgrounds.

Information: acquires and evaluates information.

- Organizes and maintains information.
- Interprets and communicates information.
- Uses computers to process information

Systems: Understands complex interrelationships

- Understands systems-knows how social, organizational, and technological systems work and operates effectively with them (Student-Staff Technologists-Patients-other members of the health care team.

Technology: Works with a variety of technologies.

- Selects technology-chooses procedures, tools, or equipment including computers and related x-ray imaging equipment.

Basic Skills: Reads, writes, performs mathematical operations, listens, and speaks.

- Reading: locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- Writing: communicates thoughts, ideas, information, and messages in writing and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- Listening: receives, attends to, interprets, and responds to verbal messages and other cues.
- Speaking: Organizes ideas and communicates verbally.

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, learns, and reasons.

- Creative thinking-generates new ideas
- Decision making-specified goals and constraints, generates alternative, considers risks, and evaluates and chooses best alternatives.
- Problem solving-recognizes problems and devises and implements plan of action.
- Knowing how to learn-uses efficient learning techniques to acquire and apply new knowledge and skills.
- Reasoning: discovers a rule or principle underlying and relationship between two or more objectives and applies it when solving a problem

Personal Qualities: Responsibility-exerts a high level of effort and perseveres toward goal attainment.

- Self esteem-believes in own self worth and maintains a positive view of self.
- Sociability-demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings.
- Self-management-assess self accurately, sets personal goals, monitors, progress, and exhibits self control.
- Integrity/honesty-chooses ethical courses of action.

Instructional Methodology

This course utilizes a traditional classroom instruction model and meets twice a week.

Course Rationale

The purpose of this course is to learn about the data acquisition process and the exploration of pulse sequences. This includes the concepts and scientific principles employed in magnetic resonance imaging techniques. Includes MR angiography, spectroscopy, diffusion/perfusion studies, quality assurance procedures, and instrumentation

Common Course Objectives

- Be prepared as a competent practitioner in magnetic resonance imaging.
- Define Gauss, Tesla, and the electromagnetic spectrum
- Describe the shim system
- Differentiate between low, mid, high, and ultrahigh field systems
- Describe how the components of an atom interact with a magnetic field
- Describe the behavior of atomic nuclei in the presence of a magnetic field

- Describe how tissue characteristics affect image quality
- Describe how TR, TE, T2, flip angle, and other parameters affect image quality
- Describe the use of gradient and RF pulses in MR image pulses
- Describe the imaging parameters that affect the image contrast
- Describe the imaging parameters that affect spatial resolution
- Discuss the use of saturation pulses in imaging arteries and veins
- Discuss MR spectroscopy, it's use, and special equipment needs

Discipline/Program Student Learning Outcomes

Upon completion of the Magnetic Resonance Program, the graduate will:

- Demonstrate satisfactory entry level clinical competency skills in MRI
- Demonstrate problem solving and critical thinking skills in the didactic and clinical components of the program.
- Demonstrate and practice professional growth and development
- Demonstrate satisfactory communication skills.

Grading System Scale

A = 93 - 100
B = 85 - 92
C = 75 - 84
D = 74 - 68 (Not passing) A grade of at least a C is necessary in order to progress in the program.

Course/Class Policies

Radiology Program Conduct Standards

- To be successful, the student will need to comply with all ACC, Program, and clinical affiliate policies, procedures, and rules at all times.
- No food or drink is allowed in any program classroom or lab.
- No disruptive behavior of anytime is allowed during lectures, labs, or clinical education rotations.
- If a student needs to consult with a faculty member regarding any sensitive course/class matter, they must do so in private.
- Any student with a specific concern about an assignment, test question, or other similar issue, needs to consult with the instructor of record in an effort to resolve the issue.
- Learning styles will vary among students. It is important to respect the learning styles of classmates.
- Students will be supervised at all times when operating the energized x-ray equipment the program lab facilities.
- In accordance with the ACC academic Dishonesty Policy, falsifying any clinical or class records can result in the initiation of the Progressive Discipline Process. Depending on the severity of the infraction, probation or withdrawal from the program can result.

Attendance

Timely completion of assignments in this course is expected. In the event that ACC is forced to cancel classes due to an emergency including weather events, all Radiology classes, labs, and clinical courses will also be canceled. Notification of closure will be made through the college's Emergency Messenger System. Students must provide ACC with a contact number to be part of the Emergency Messenger System. In case of an emergency, all staff, faculty, and students who have updated their information, will receive a voice mail or text message within minutes. Emails will also be sent to the student's ACC g-mail account. The message and email will tell you the nature of the emergency and what action you should take if any. Information will also be available through local radio and TV stations as well as ACC's Channel 19. Students out of immediate broadcast area should check the ACC website: http://www.austincc.edu for information.

It is essential that you attend class consistently. You will be provided information in lecture that is not necessarily in the reading material and in the event of an absence, it will be the student's responsibility to secure any missed materials distributed in class. Instructor notes or outlines are not available from the faculty. Three days is the limit for absences in the class. Absences in excess of three may result in withdrawal from the course.

Technical Standards and Essential Functions

Health Sciences Programs establish technical standards and essential functions to ensure that students have the abilities to participate and potentially be successful in all aspects of the respective program. Students are required to meet technical standards and essential function for the Radiography Program as indicated in the MRI Student Handbook. The policy is found on page 11 in the handbook and the web address is:
http://www.austincc.edu/health/radr/documents/MRI_Student_Handbook_11_12.pdf

Electronic Devices

The use of any electronic device is prohibited within the Radiology Program lab facilities, at the clinical sites, and during all class sessions. You may use a calculator, however cell phones with calculator functions may not be used. The student is prohibited from having a cell ph one or pager on h is/her person while in the clinical site or in the program labs. Use of computers and recording devices is permitted only if the student obtains permission from the instructor.

Computer Access/Email

All students must be able to access the ACC online teaching platform, Blackboard, and their ACC email accounts (assigned by the college). Students may utilize any of the computers on any ACC campus to check their email accounts and to access Blackboard. Blackboard and email accounts should be checked frequently for assignments, announcements and/or messages.

Computer Skills

Radiology Students are required to demonstrate a variety of computer skills through the length of the program. All Clinical sites utilize computer systems for patient schedules and patient information. Radiology students must be able to utilize any clinical site's data/patient management system as permitted by the clinical site. A student who is unfamiliar with using a computer or who has limited computer skills is expected to seek instruction in computer programs and usage so that he/she will be able to meet the requirements of his/her courses.

Appealing/Inquiring About a Grade

If you have a question about a grading policy and/or a specific assignment grade, you must raise your question while enrolled in the course. Meet with the instructor of record and discuss your questions or issues. Document in writing what you discuss and the outcome of the discussion in case you later request a ***Review of Final Course Grade (http://www.austincc.edu/catalog/pdf/ACC-Catalog-FY11-12.pdf)***

If you are unable to resolve your questions or concerns with your instructor, make an appointment with the Department Chair to discuss the matter or, if the instructor is the department chair, with the Dean of Health Sciences. If you need help locating the Department Chair or Dean, visit Student Services on any campus or refer to the website at ***http://www.austincc.edu/dept***

Statement on Scholastic Dishonesty

A student attending ACC assumes responsibility for conduct compatible with the mission of the college as an educational institution. Students have the responsibility to submit coursework that is the result of their own thought, research, or self-expression. Students must follow all instructions given by faculty or designated college representatives when taking examinations, placement assessments, tests, quizzes, and evaluations. Actions constituting scholastic dishonesty include, but are not limited to plagiarism, cheating, fabrication, collusion, and falsifying documents. Penalties for scholastic dishonesty will depend upon the nature of the violation and may range from lowering a grade on one assignment o an "F" in the course and/or expulsion from the college. Se the ***Student Standards of Conduct and Disciplinary Process*** and other policies at:
http://www.austincc.edu/current/needtoknow

Student Rights and Responsibilities
Students at the college have the rights accorded by the U.S. Constitution to freedom of speech, peaceful assembly, petition, and association. These rights carry with them the responsibility to accord the same rights to others in the college community and not to interfere with or disrupt the educational process. Opportunity for students to examine and question pertinent data and assumptions of a given discipline, guided by the evidence of scholarly research, is appropriate in a learning environment. This concept is accompanied by an equally demanding concept of responsibility on the part of the student. As willing partners in learning, students must comply with college rules and procedures.

Statement on Students with Disabilities
Each ACC campus offers support services for students with documented disabilities. Students with disabilities who need classroom, academic, or other accommodations must request them through the Office of Students with Disabilities (OSD). Students are encouraged to request accommodations when they register for courses or at least three weeks before the start of the semester, otherwise the provision of accommodation may be delayed.

Students who have received approval for accommodations from OSD for this course must provide the instructor with the "Notice of Approved Accommodations" from OSD before accommodations will be provided. Arrangements for academic accommodations can only be made after the instructor receives the 'Notice of Approved Accommodations" from the student. Student with approved accommodations are encouraged to submit the "notice of Approved Accommodations" to the instructor at the beginning of the semester because a reasonable amount of time may be needed to prepare and arrange for the accommodation. Additional information about the Students with Disabilities is available at: http://www.austincc.edu/support/osd/

Safety
Austin Community college is committed to providing a safe and healthy environment for study and work. You are expected to learn and comply with ACC environmental, health and safety procedures and agree to follow ACC safety policies. Additional information on these can be found at http://austincc.edu/ehs

Because some health and safety circumstance are beyond our control, we ask that you become familiar with the Emergency Procedures poster and Campus Safety Plan map in each question. Additional information about emergency procedures and how to sign up for ACC Emergency Alerts to be notified in the event of a serious emergency can be found at: http://www.austincc.edu/emergency/

Please note, you are expected to conduct yourself professionally with respect and courtesy to all. Anyone who thoughtlessly or intentionally jeopardizes the health or safety of another individual will be dismissed the day's activity, may be withdrawn from the class, and/or barred from attending future activities.

Use of ACC email
All college email communication to students will be sent solely to the student's ACCmail account, with the expectation that such communication will be read in a timely fashion. ACC will send important information and will notify you of any college related emergencies using this account. Students should only expect to receive email communication from their instructor using this account. Likewise, students should use their ACCmail account when communicating with instructors and staff. Instructions for activating an ACC account can be found at http://www.austincc.edu/accmail/index.php

Withdrawal Policy
It is the responsibility of each student to ensure that his or her name is removed from the roll should he or she decide to withdraw from the class. The instructor does, however, reserve the right to drop a student should he or she feel it is necessary. If a student decides to withdraw, he or she should also verify that the withdrawal is submitted before the final withdrawal date. The student is also strongly encourage dot retain their copy of the withdrawal form for their records. Students who enroll for the third or subsequent time in a course taken since Fall, 2002, may be charged a higher tuition rate, for that course.

State law permits students to withdraw from no more than six courses during their entire undergraduate career at Texas public colleges or universities. With certain exceptions, all course withdrawals automatically count toward this limit. Details regarding this policy can be found in the ACC college catalog.

ACC policy: Incomplete

A student in good standing in a Radiology Course may request an incomplete grade for that course if the following is determined by Department Chair to be present: serious illness or injury that prevents the student from completing coursework by the end of the semester but will not affect the student's continuance in the program or significant personal circumstances that would prevent the student from attending class or clinical.

Student and Instructional Services

ACC strives to provide exemplary support to its students and offers a broad variety of opportunities and services. Information on these services and support systems is available at: http://www.austincc.edu/s4/

Links to many student services and other information can be found at: http://www.austincc.edu/current/

ACC Learning Labs provide free tutoring services to all ACC students currently enrolled in the course to be tutored. The tutor schedule for each Learning Lab may be found at: http://www.austincc.edu/tutor/students/tutoring.php

For help setting up your ACCeID, ACC Gmail, or ACC Blackboard, see a Learning Lab Technician at any ACC Learning Library.

Additional Policies

Please review the following college website for additional important information about general policies: http://www.austincc.edu/current/needtoknow.

Also review the MRI program student handbook on-line at:
http://www.austincc.edu/health/radr/documents/MRI_Student_Handbook_11_12.pdf

Course Outline/Calendar

This section demonstrates the topics that will be covered each week. Please note that the sections marked with a * represent assignments that will require the use of the program lab facilities to complete an assignment/project.

Session #	Topic/Subject Matter
#1	Introduction to MRI Physics
#2	Fundamentals of MRI Physics
#3	Fundamentals of MRI Physics
#4	Instrumentation
#5	Instrumentation
#6	Physical Principles
#7	Unit I Examination
#8	Image Weighting/Contrast
#9	Spatial Encoding
#10	Image Formation
#11	Image formation
#12	Unit 2 test
#13	Volume Imaging
#14	Volume Imaging
#15	Pulse sequences
#16	Pulse Sequences
#17	Pulse Sequences
#18	Unit 3 Test

#19	Quality Control
#20	Parameters
#21	Parameters
#22	Artifacts
#23	Artifacts
#24	Unit 4 Test
#25	Flow phenomena
#26	Vascular imaging
#27	Contrast
#28	Function imaging
#29	Spectroscopy
#30	Unit 5 Test
#31	Review
#32	Final Examination