FLORIDA ATLANTIC UNIVERSITY™

Graduate Programs—COURSE CHANGE REQUEST[1]

UGPC APPROVAL _____
UFS APPROVAL _____
SCNS SUBMITTAL _____
CONFIRMED _____
BANNER POSTED _____
CATALOG _____

DEPARTMENT: PHYSICS	COLLEGE: CHARLES E. SCHMIDT COLLEGE OF SCIENCE
COURSE PREFIX AND NUMBER: RAT 6616	CURRENT COURSE TITLE: MEDICAL IMAGING PHYSICS
CHANGE(S) ARE TO BE EFFECTIVE (LIST TERM): SPRING 2016	____ TERMINATE COURSE (LIST FINAL ACTIVE TERM):
CHANGE TITLE TO: CHANGE PREFIX FROM: TO: CHANGE COURSE NO. FROM: TO: CHANGE CREDITS[2] FROM: TO: CHANGE GRADING FROM: TO: CHANGE DESCRIPTION TO: Course covers the mathematical and physical principles of medical imaging and its applications as recommended by the AAPM. Students will obtain a good understanding of Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound Imaging (US), Fluorescence and Nuclear Medical Imaging.	CHANGE PREREQUISITES/MINIMUM GRADES TO*: CHANGE COREQUISITES TO*: CHANGE REGISTRATION CONTROLS TO: *Please list both existing and new pre/corequisites, specify AND or OR, and include minimum passing grade.

Attach syllabus for **ANY** changes to current course information.

Should the requested change(s) cause this course to overlap any other FAU courses, please list them here.	Please consult and list departments that might be affected by the change(s) and attach comments.[3]

Faculty contact, email and complete phone number: Dr. Th. Leventouri, leventou@fau.edu, 561-297-2695
Dr. George Kalantzis, fau.gkalantzis@fau.edu, 561-297-2695

Approved by:	*Date:*
Department Chair: Warner A Miller	11/14/14
College Curriculum Chair:	01/03/15
College Dean:	01/06/15
UGPC Chair:	1/14/15
Graduate College Dean:	1/21/15
UFS President:	
Provost:	

1. **Syllabus** must be attached; see guidelines for requirements: *www.fau.edu/provost/files/course syllabus.2011.pdf*
2. Review **Provost Memorandum: Definition of a Credit Hour** *www.fau.edu/provost/files/Definition_Credit_Hour_Memo_2012.pdf*
3. **Consent** from affected departments (attach if necessary)

Email this form and syllabus to *UGPC@fau.edu* **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

FAU FLORIDA ATLANTIC UNIVERSITY

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Professional Science Master in Medical Physics
RAT 6616 Medical Imaging Physics

Course Syllabus

Course title/number, number of credit hours

Course Title: **Medical Imaging Physics**	
Term: Spring	Classroom location: SE 101
Is this an online course: Yes ___ or No X__	Credit hours: 3
CRN(optional):	Course number: RAT 6616

Course prerequisites or co-requisites N/A

Course number:	
Pre-requisites Course Title:	

Course number:	
Pre-requisites Course Title:	

Course number:	
Pre-requisites Course Title:	

Permission of the instructor is required: Yes ___ or No X__	

Instructor contact information

Instructor: Dr. George Kalantzis	Office: SE 113
Office Hours: M, W 1-2 & open door policy	Office Phone: 561-297-2695
E-mail Address: fau.gkalantzis@fau.edu	

TA contact information (if applicable) N/A

TA Name:	Office:
Office Hours:	Office Phone:
E-mail Address:	

Course description

A course providing an introduction to each medical imaging modality, explaining the mathematical and physical principles and giving an understanding of how medical images are obtained and interpreted. Imaging modalities which will be covered are: Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound Imaging (US), Fluorescence and Nuclear Medical Imaging. Other topics include: image formation, reconstruction process, discussion on image quality and equipment, clinical applications and biological effects and safety issues. The lectures will be accompanied with practical exercises/problems in Matlab to provide a better understanding of the course material.

Course objectives/student learning outcomes

At the end of this course the students are expected to have a good understanding of: fundamental concepts of each medical imaging modality, image quality and reconstruction techniques, application of contrast agents in medical imaging, equipment QA, safety issues for each modality, familiarization with medical image processing with Matlab

Course topical outline

Including dates for exams/quizzes, other graded projects, breakdown of topics covered by day or week

Date	Topic	Assignments
Week 1	Introduction to digital image processing. Lab 1: Introduction to Matlab	Questions
Week 2	Radiography: X-ray detectors, dual energy imaging, image quality and clinical use. Screen-Film radiography, Film processing, mammography.	Questions/Problems
Week 3	Lab 2: Basic concepts of image processing (Filters, Transformations)	Questions
Week 4	Exam 1 Computed Tomography: Detectors in CT, Dual energy CT, Radiographic contrast agents, Cardiac CT, reconstruction modes	Questions/Problems

Week 5	Lab 3: CT reconstruction with Matlab	Web reading
Week 6	Fluoroscopy : Detector technologies, radiographic contrast agents, angiography, Automatic Brightness Control (ABC).	Questions/Problems/Web reading
Week 7	Special Topics: Optical Coherence Tomography	Articles and Web reading
Week 8	Nuclear Medicine Imaging: Radionuclides, counting systems and gamma camera, physics of SPECT and PET. Lab 4: Matlab based image processing in Nuclear Medicine.	Questions/Problems
Week 9	Exam 2 Special Topics: X-ray Fluorescence CT.	Journal Articles reading
Week 10	Ultrasound Imaging: Physics of acoustic waves, diagnostic transducers, Doppler, Elasticity imaging methods, artifacts	Questions/ Web reading
Week 11	Magnetic Resonance Imaging: Physics of transmitted signal, signal detection and detector, T1 & T2 relaxation, Definition of common acquisition parameters.	Questions/Web Reading.
Week 12	Special Topics: contrast agents in MRI and US.	Journal Articles reading

Week 13	Exam 3	
Week 14	Special topics: Basic concepts of medical image registration. Lab_5: Image registration with Matlab.	Book chapters/Web reading
Week 15	Radiation Safety in medical imaging modalities. Visit to Clinique for QAs test of EPID and CT.	Web AAPM reading. TG reports reading
	FINAL EXAM	

Course evaluation method

The letter grade is decided from four exams (25/100 each) including the final.

Course grading scale (optional-needed if it differs from the catalog grading scale)

Policy on makeup tests, late work, and incompletes (if applicable)

Student meets with the Instructor for arrangements.

Special course requirements (if applicable) N/A

Required texts/readings

Textbook: (1) *Fundamentals of Medical Imaging,* second edition, P. Suetens.

Supplementary/recommended readings (if applicable)
(2) *Medical Imaging Physics,* fourth edition, W. R. Hendee, E. R. Ritenour. **(3)** *The Essential Physics of Medical Imaging,* second edition, J. T. Bushberg, J. A. Seibert, E. M. Leidholdt, J. M. Boone. **(4)** *Biosignal and Biomedical Image Processing: MATLAB-based applications,* J.L. Semmlow
American Institute of Physics–*http://www.aip.org/ojs/service/html.*

Bibliography:

Sources of Journal Articles

American Association of Physicist in Medicine (AAPM) http://scitation.aip.org/medphys/Medical Physics

Classroom etiquette policy (if applicable)

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) - in Boca Raton, SU 133 (561-297-3880); in Davie, MOD 1 (954-236-1222); in Jupiter, SR 117 (561-799-8585); or at the Treasure Coast, CO 128 (772-873-3305) – and follow all OSD procedures.

Honor Code policy statement

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf