Florida Institute of Technology

ADDING A NEW COURSE TO THE CURRICULUM

This course is available for student registration only after the approval process has been completed.

SUBJECT B M E
(Course No. 4410)
(eg. 1301)

CREDIT HOURS 3
TERM TO BE ADDED TO THE FILE Fall 2014
(eg. Fall 2016)

CLASS HOURS 45
LECTURE HOURS 45
LAB HOURS
CONTACT HOURS (CEU ONLY)

DEPARTMENT Biomedical Engineering
(e.g., Computer Sciences)

SCHEDULE TYPE Lecture (A)

□ COLLEGE OF AERONAUTICS - 23
□ COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS - 25
□ COLLEGE OF SCIENCE - 26
□ EXTENDED STUDIES / NATHAN M. BISK COLLEGE OF BUSINESS - 90

COMPUTER TITLE Restricted to 25 characters, including spaces
Intro Biomedical Imaging

CATALOG TITLE
Introduction to Biomedical Imaging

CATALOG DESCRIPTION OF COURSE Restricted to 250 characters, including spaces
Introduces medical imaging technologies from a biomedical engineering perspective. Discusses instrumentation, physics, mathematics, and clinical applications of medical imaging modalities including x-ray, computed tomography, magnetic resonance imaging, positron emission tomography, ultrasonography, optical, fluorescence and molecular imaging.

This description has been approved by the catalog office

Catalog Director

GRADES TO BE ISSUED
□ A, B, C, D, F
□ A, B, C, D, F, CEU/Audit
□ CEU
□ S, U
□ R, F
□ Other

ADDITIONAL RESTRICTION
PHY 2002
(e.g., Major, Class Level, Department Head Approval)

If this course replaces a course currently offered in BANNER, please indicate old course information and the date when the course may be removed from the system.

SUBJECT Alpha Prefix (e.g., CSE)
(Course No. 1301)

TERM TO INACTIVATE

□ Yes □ No Will this course be used to measure program-level student learning outcomes? If yes, review and signature required.

□ Yes □ No Will this course be used to satisfy the scholarly inquiry requirement? If yes, attach "Q" material for review.

APPROVALS: On completion of description and course number verification, affix appropriate signatures as indicated, and submit completed form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for approval.

OR

Chair, Graduate Council
Date

Chair, Undergraduate Curriculum Committee
Date

**Associate Vice President for Institutional Effectiveness
Date

CATALOG DIRECTOR
These changes/additions have been made for
University Catalog and entered into the BANNER team named above.

Catalog Director

REGISTRAR'S USE ONLY

SCACSRK __________ SCADERL __________ SCAPRQ __________ SCABASE __________

SCACRKS __________ Operator Initial __________ Date

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8318-189-1013
BME 4410 INTRODUCTION TO BIOMEDICAL IMAGING
Fall 2014

2014-15 Catalog Data: 3 Credits. Introduction to medical imaging technologies from a biomedical engineering perspective. Discussion of instrumentation, physics, mathematics, and clinical applications of medical imaging modalities including: x-ray and computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), and ultrasound. Introduction to emerging technologies including biophotonics (optical, fluorescence, and molecular imaging) and photoacoustic tomography (PAT). (Pre-requisites: CHM 2001 Organic Chemistry 1, MTH 2201 Diff Eq./Linear Algebra, PHY 2002 Physics 2, BIO 3210 Mammalian Physiology)

Credits & Contact Hours: 3 Credits, 30 lectures (75 mins)

Required or Elective or Selected Elective: Restricted Elective


Prerequisites by Topic: General Chemistry (basic physical chemistry; nuclear chemistry), Organic Chemistry (organic structures), Biology (structure and function relationships), Physics (electromagnetism; optics; radioactivity), Mathematics (basic statistics; linear algebra), and Physiology (tissue organization; organs and organ system function).

Corequisite: None

Grading Policy:
- Homework: 15%
- Presentation: 25%
- Midterm Exam: 30%
- Final Exam: 30%


Course Outcomes: Students, upon completing this course, should be able to understand the following:
1. Understand the different methods and modalities used for biomedical imaging
2. Identify preferred medical imaging methods for different clinical applications
3. Understand and apply basic mathematical principles of medical image processing and analysis for each imaging modality and image reconstruction algorithms
4. Understand engineering, physics and scientific principles underlying the function and operation of the different imaging modalities
5. Learn about current and evolving clinical imaging technologies
6. Develop skills for interpreting current medical and scientific literature in the field
7. Present on a topic of medical imaging and communicate technical knowledge

**Topics Covered and Associated Time:**

1. Introduction and history of biomedical imaging (1 lecture)
2. General Image characteristics (1 lecture)
3. Basics of image processing and image analysis (2 lecture)
4. Radiation interactions with matter and radiation biology (1 lecture)
5. X-Ray radiography (2 lecture)
6. Computed Tomography (2 lecture)
7. Magnetic Resonance Imaging (2 lecture)
8. Nuclear Medicine (1 lecture)
9. Single Photon Emission Tomography (1 lecture)
10. Positron Emission Tomography (2 lectures)
11. Combined modality imaging – PET/CT and PET/MRI (2 lectures)
12. Ultrasound (1 lecture)
13. Introduction to Biophotonics (2 lecture)
14. Optical imaging and optical coherence tomography (1 lecture)
15. Fluorescence imaging and fluorescence tomography (1 lecture)
16. Photoacoustic tomography (1 lecture)
17. Emerging Technologies - Molecular imaging (1 lecture)
18. Clinical Imaging Applications in Oncology, Cardiology and Neurology (1 lecture)
19. Student Presentations on (3 lectures)

**Class Schedule:** Tuesday & Thursday: 3:30 PM – 4:45 PM

**Contribution of Course to Meeting the Requirements of Curriculum:** This course meets the requirements of three and half years of engineering science topics.

**Relationship of Course Outcomes to Program Outcomes:** See assessment matrix.

**Prepared By:** Dr. Michael Fenn, Department of Biomedical Engineering.
### Outcomes Assessment Matrix for BME 4410

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Relationship of Course Outcomes to Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C, D, E, F, G, H, I, J, K</td>
<td>◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇</td>
</tr>
</tbody>
</table>

### Key

- **a**: An ability to apply knowledge of mathematics, science, and engineering
- **b**: An ability to design and conduct experiments, as well as analyze and interpret data
- **c**: An ability to design a system, component, or process to meet society’s desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- **d**: An ability to function on multi-disciplinary teams
- **e**: An ability to identify, formulate, and solve engineering problems
- **f**: An understanding of professional and ethical responsibility
- **g**: An ability to communicate effectively
- **h**: Have a broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- **i**: A recognition of the need for, and an ability to engage in, life-long learning
- **j**: A knowledge of contemporary issues
- **k**: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

◇ = The course outcome lightly addresses the Student Outcome
◆ = The course outcome strongly addresses the Student Outcome

Course outcomes assessment matrix completed by: Michael Fenn, Ph.D., Assistant Professor, Biomedical Engineering

Date: 1/14/2014