**Course Request and Maintenance System**

**Course Approval Form**

*(Approved)*

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<tr>
<th>Coll./Schl./Div.:</th>
<th>College of Engineering</th>
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<tbody>
<tr>
<td>Dept./Comm./Prog.:</td>
<td>Electrical Engineering</td>
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<tr>
<td>Action:</td>
<td>NEW</td>
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<tr>
<td>Course Level:</td>
<td>Graduate Course</td>
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<tr>
<td>Course Type:</td>
<td>Standard Course</td>
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<tr>
<td>Effective:</td>
<td>Summer 2010</td>
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<tr>
<td>Offered once only:</td>
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<td>Offered summer sessions only:</td>
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<td>Quarter(s) Offered:</td>
<td>Spring</td>
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<td>Last Approved Form Effective:</td>
<td>(Submitted: )</td>
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<td>Notes:</td>
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<table>
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<tr>
<th>Course Number:</th>
<th>EE 274</th>
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<tbody>
<tr>
<td>Renumbered From:</td>
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<tr>
<td>Course Title:</td>
<td>Introduction to Medical Imaging and Analysis</td>
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<tr>
<td>E-Z Segment Title:</td>
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<tr>
<td>Units:</td>
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<td>Activity(ies):</td>
<td>Lecture, 1 hour per week (group activity)</td>
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<td></td>
<td>Laboratory, 3 hours per week (group activity)</td>
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<td>Prerequisite(s):</td>
<td>graduate standing or consent of instructor</td>
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<tr>
<td>Description:</td>
<td>An introduction to medical imaging. Includes associated computational techniques for x-ray imaging, computed tomography, magnetic resonance imaging, positron emission tomography, ultrasound, radiotherapy, and molecular imaging.</td>
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<td>Grading Type:</td>
<td>Letter Grade or petition for Satisfactory/No Credit (S/NC)</td>
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<td>In Progress:</td>
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<td>Statement:</td>
<td>May be taken Satisfactory (S) or No Credit (NC) with consent of instructor</td>
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https://crams.ucr.edu/crams/printForm.print_course?p_sCourse_id=1000012187&p_sRev... 11/29/2012
and graduate advisor

Repeatable: No

Maximum Units:

Statement:

Cross-listed With:

Credit Statement:

If repeatable, may be taken more than once per quarter: No

Breadth Statement:

Instructor(s): Professor Bir Bhanu

Justification:
The Video Bioinformatics NSF IGERT program is interdisciplinary. It develops new techniques and analytical tools for video bioinformatics. Video Bioinformatics program will cover the entire range of imaging modalities from nanometer to meter of spatial resolution. This Video Bioinformatics course deals with millimeter to meter scale of spatial resolution and varying temporal resolution.

Correspondence:

Overlaps/Duplicates Other Courses: No

Affects Programs: No

Affects Prerequisites/Descriptions: No

Syllabus:

EE 274
Introduction to Medical Imaging
Professor Bir Bhanu

This course is an introduction to medical imaging that will cover all the major medical imaging modalities. The student will learn the physical and theoretical basis behind each instrument and the types of information that can be obtained. The types of medical imaging that will be covered in this course are magnetic resonance imaging, positron emission tomography, ultrasound, computed tomography, x-ray and others. Each class will delve into how each of these instruments obtain their images, what information content is contained in the images and real-life examples will be shown. Finally, the student will also be required to know applicable analysis techniques that are available to
extract the information from these images. In the laboratory section of the course the student will be introduced to the instruments and basic analysis software to extract information. At the end of the course the student is expected to have a proficient understanding of the major imaging modalities used clinically today, the physical basis for the images and what information content the resultant images can provide. Imaging specialists will be brought in to provide expertise in various imaging modalities as needed.

Textbooks and Course Material

3. iLearn, Lecture notes & images in class are under Course Material

Grading Criteria:
Laboratory Reports 50%
Final Exam 50%

Lecture Schedule (1 hour/week)

Week Topic

1. X Ray Imaging: Chapter 4 (APD), Chapter 1, 3, 5 (JTB)
2. Computed Tomography (CT) Imaging: Chapter 13 (JTB)
5. Magnetic Resonance Imaging (MRI): Clinical and research applications: Chapter 12 (JTB)
6. Positron Emission Tomography (PET) Imaging: Chapter 22 (JTB)
7. Ultrasound Imaging: Chapter 16 (JTB)
8. Radiotherapy: Conformal and intensity modulated radiation therapy, Fractionation: Chapter 25 (JTB)
9. Molecular Imaging: The future of medicine: Chapter 11 (APD)
10. Image Analysis, Statistical analysis of medical images: Chapter 6-10 (APD)

Laboratory Schedule (3 hours/week)

Week 1, Medical imaging safety. X-ray, computed and positron emission tomography, magnetic resonance imaging. What to do and what not to do.

Week 2, X-Ray/Computed Tomography. Collect phantom data, extract quantitative values. Learn 3D reconstruction software.

Week 3, Magnetic Resonance Imaging: Image data collection, T1, T2, SWI, DWI, DTI

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Week 4, Magnetic Resonance Imaging: Image data analysis, process MRI data from Week 2

Week 5, Magnetic Resonance Imaging: Image data analysis. Computational approaches, HRS, Symmetry etc.

Week 6, Positron Emission Tomography: Collect live data, process data and analyze

Week 7, CT/PET/MRI Image Registration: use software to merge data sets and provide overlays

Week 8, Ultrasound: Data collection and process data

Week 9, Radiotherapy: Overview and visit to Proton treatment facility

Week 10, Molecular Imaging/Statistical Analysis: Contrast imaging, new probes, statistics

Approvals:

Department/Committee/Program Faculty: 10/26/2009
Submitted by
Department/Committee/Program Chair: Roger Lake 10/26/2009
Reviewed by Courses Specialist: C. Spina 02/26/2010
Reviewed by Dean of College/School/Division: Reza Abbaschian 03/01/2010

Executive Committee
College of Engineering:
College of Humanities, Arts, and Social Sciences:
College of Natural and Agricultural Sciences:
Division of Biomedical Sciences:
Graduate School of Education:
Graduate School of Management:
University Honors Program:

Dean of the Graduate Division: Alan E. Williams 03/19/2010
Graduate Council:
Alan E. Williams 03/19/2010
Committee on Courses:
THEDA SHAPIRO 04/15/2010