BM 688: SPECIAL STUDIES: MRI: ADVANCED TOPICS
Spring 2010

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Yeditepe University Biomedical Engineering, A-205, Phone: 216-578-0000(ext. 3210)
Office Hours: Tuesdays 13:00 – 14:00 pm
Class Meetings: Tuesdays 14:00 - 17:00 pm
Prerequisites: BM 641 Magnetic Resonance Imaging Principles, knowledge of MATLAB
Number of Credits: 3 units

This course was designed as a continuation to BM 641 Magnetic Resonance Imaging Principles class and will discuss advanced MRI pulse sequences, and data reconstruction methods.

Textbook:
- Principles of Magnetic Resonance Imaging, Liang and Lauterbur, 2000
- Handbook of MRI Pulse Sequences, Bernstein, King and Zhou, 2004

This book has been scanned by the Bogazici library and been placed at the reserve section online. To access it go to the Bogazici library website and choose the reserve section link and search for BM 688. The direct link is:
http://seyhan.library.boun.edu.tr/search~S5?/rBM+688/rbm+688/1,1,1,B/frameset~1558896&FF=rbm+688&1,1,
You need a barcode and pin to enter this section that you can get from the circulation desk at the library entrance.

Recommended Further Reading:
- Principles of Magnetic Resonance Imaging, Nishimura
  This book has also been scanned by the Bogazici Library and placed at the Reserve section online. You can access it as detailed above.
- http://www.cis.rit.edu/htbooks/nmr/bnmr.htm
- http://www.cis.rit.edu/htbooks/mri/
- http:// www.revisemri.com
- http://www.ismrm.org/mr_sites.htm#Education

Grading
Grades will be assigned based on your overall performance in the class. Your grade will be composed of:

Attendance and Participation	10%
Homework	20%
Project	25%
Midterm	20%
Final Exam	25%

In case you will miss an exam due to an emergency, or some other valid reason please notify me as soon as possible and before the exam time. If you have a time conflict due to another non-emergency reason, please notify me at least two weeks before the exam in order to reach a timely resolution for the situation.

WORKING TOGETHER on Individual Assignments: This course will have some amount of computing work for assignments. It is acceptable to work together, but each student is expected to do his or her own work on the "individual" assignments.

Timely feedback will be given for your homework and exams for you to understand possible areas of improvement. **The midterm and final exams will be in class and closed book.**

Topics

- RF Pulses – Bernstein, Chapter 2-5
- Gradients – Bernstein, Chapter 7-10
- Common Image Reconstruction Techniques
    - Liang and Lauterbur, Chapter 6
    - Bernstein, Chapter 13, Section 1,2
- Image Contrast
    - Liang and Lauterbur, Chapter 7
    - Bernstein, Chapter 14
- Image Artifacts – Liang and Lauterbur, Chapter 8, Section 3
- Fast Imaging
    - Liang and Lauterbur, Chapter 9
    - Bernstein, Chapter 13, Section 3
    - Bernstein, Chapter 16
    - Bernstein, Chapter 17, Section 6
    - Compressed Sensing
- Constrained Reconstruction
    - Liang and Lauterbur, Chapter 10
    - Bernstein, Chapter 11
    - Bernstein, Chapter 13, Section 4,5,6
- Advanced MRI Techniques
    - Spectroscopy
    - Diffusion Imaging – Bernstein, 17.2
    - Perfusion
    - fMRI
    - Angiography – Bernstein, Chapter 15