

**FMRI Lab (G89.2245) Spring 2007**

**Course Objectives**

The goal is to cover the major topics and issues in the field of fMRI. With this background, students will be able to design and implement their own fMRI experiments.

**Schedule for Spring 2007**


**Faculty**

Professor David Heeger

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Professor Souheil Inati

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**Logistics**

**Prerequisites**

Graduate standing in Psychology or Neural Science or permission of the instructors.

**Assignments and grading**

There will be weekly lab projects that will involve acquiring and analyzing fMRI data, and submitted written lab reports. Final grades will be based on the lab reports. The lectures will provide background information that will be useful in performing the labs, along with additional information for a broader and deeper understanding of fMRI methods.

**Readings**

**Text book**
Huettel, Song, & McCarthy, Functional Magnetic Resonance Imaging, Sinauer, 2004
The textbook is available in the NYU Bookstore.

**Additional readings**
Notes, handouts and papers available on the course website.

**Location**

**Labs** Th 2:30–5, Meyer rooms 156 (Center for Brain Imaging) and 208 (CBI Image Analysis Lab)
**Lectures** F 2–3:15, Meyer room 878
FMRI Lab (G89.2245)

Schedule Spring 2007

Week 1: Jan. 18, 19

Lab: MRI safety and console training

*Thu Jan 18*

Reading:

- Huettel, chapters 1 and 2
- Kanal et al (2002a)
- Shellock & Crues (2002)
- Kanal et al (2002b)
- Schenck (2000)

Lab Handout and Assignment: Scanner Intro

Lecture: Linear systems and convolution

*Fri Jan 19. Heeger*

- Lecture slides

Reading:

- Linear systems handout (intro) [http://www.cns.nyu.edu/~david/linear-systems/linear-systems.html]
- Linear systems handout (advanced)
- Another linear systems handout

Week 2: Jan. 25, 26

Lab: FSL

*Thu Jan 25.*

Reading:

- FSL documentation [http://www.fmrib.ox.ac.uk/fsl]

Lab Handout and Assignment: fsl
Lecture: Fourier transform

Fri Jan 26. Heeger

Lecture slides

Reading:

- Linear systems handouts (Listed Above)

Week 3: Feb. 1, 2

Lab: Unix and MATLAB

Thu Feb 1.

Reading:

- Unix Tutorial [http://www.ee.surrey.ac.uk/teaching/unix]
- MATLAB Getting Started Guide

Reference Book:

Lab Handout and Assignment: matlab_intro

Lecture: Regression

Fri Feb 2. Heeger

Lecture slides

Reading:

- Huettel, chapter 12
- Linear algebra handout
- Least-squares and regression handout

Week 4: Feb. 8,9

Lab: Linear systems, regression, and fMRI data analysis

Thu Feb 8.

Lab Handout and Assignment: blockDataAnalysis

Lecture: Event-related experimental design
Fri Feb 9. Inati

Reading:
- Huettel, chapter 11

Week 5: Feb. 15, 16

Lab: Block design part I

Thu Feb 15.

Lab Handout and Assignment: blockDesign1

Lecture: Statistics

Fri Feb 16. Heeger

Lecture slides

Reading:
- Huettel, chapter 12
- Raz et al, Neuroimage, 2003
- MGH FMRI Course Probability Notes
- MGH FMRI Course Statistics Notes

Week 6: Feb. 22, 23

Lab: Block design part II

Thu Feb 22.

Lab Handout and Assignment: blockDesign2

Lecture: MRI physics part I

Fri Feb 23. Inati

Reading:
- Huettel, chapter 2
- Huettel, chapter 3

Week 7: Mar. 1, 2
Lab: Block design part III

_Thu Mar 1._

Lab Handout and Assignment: blockDesign3

Lecture: MRI physics part II

_Fri Mar 2. Inati_

Reading:

- Huettel, chapter 4

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**Week 8: Mar. 8, 9**

Lab: Temporal summation part I

_Thu Mar 8._

Lab Handout and Assignment: temporalSummation

Lecture: MRI physics part III

_Fri Mar 9. Inati_

Reading:

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**Week 9: Mar. 15, 16**

Spring Break

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**Week 10: Mar. 22, 23**

Lab: Temporal summation part II

_Thu Mar 22._

Lecture: Pulse sequences and image contrast

_Fri Mar 23. Inati_

Reading:

- Huettel, chapter 5
Week 11: Mar. 29, 30

Lab: Measuring T1, T2, and T2*

*Thu Mar 29.*

Lab Handout and Assignment: measuringT1T2

Lecture: Noise, artifacts, and reliability

*Fri Mar 30. Inati*

Reading:
- Huettel, chapter 9
- Lecture slides

Week 12: Apr. 5, 6

Lab: Resolution, Image Quality and Artifacts

*Thu Apr 5.*

Lab Handout and Assignment: image_quality

Lecture: Neural activity, hemodynamics, and spatiotemporal resolution

*Fri Apr 6. Heeger*

  Lecture slides

Reading:
- Huettel, chapter 6
- Huettel, chapter 8

Week 13: Apr. 12, 13

Lab: Event–related fMRI part I

*Thu Apr 12.*

Lab Handout and Assignment: eventRelated1

Lecture: Flat maps and topography
**Fri Apr 13. Heeger**

Lecture slides

**Reading:**

- Van Essen (2002)
- Wandell (2005)

**Week 14: Apr. 19, 20**

Lab: Event-related fMRI part II

**Thu Apr 19.**

Lab Handout and Assignment: [eventRelated2](https://cbi.nyu.edu/wiki/internal/course/syllabus)

Lecture: Inter-subject correlation and functional connectivity

**Fri Apr 20. Guest Instructor**

**Week 15: Apr. 26, 27**

Lab: Event-related fMRI part III

**Thu Apr 26.**

Lab Handout and Assignment: [eventRelated3](https://cbi.nyu.edu/wiki/internal/course/syllabus)

Lecture: Classifier analysis

**Fri Apr 27. Guest Instructor**