

**BIOENGINEERING 597A – Functional Neuroimaging: *Visualizing the Brain at Work* - Spring 2014****1:00- 2:15 Tuesday and Thursday in 123 Pond Lab****Schedule Number 334720****Nanyin Zhang, PhD ([nuz2@psu.edu](mailto:nuz2@psu.edu); 814-867-4791)***Associate Professor of Bioengineering**W341 Millennium Science Complex, University Park, PA 16802*

<b>Date</b>	<b>Topic</b>
01/14	Class overview, Image principles and image properties
01/16	Nuclear Magnetic Resonance
01/21	Magnetic Resonance Imaging
01/23	Basic Physics of Magnetism and NMR
01/28	Relaxation and Contrast in MRI
01/30	Mapping the MR Signal
2/4	Diffusion and the MR Signal
2/6	MRI Techniques
2/11	Noise and Artifacts in MR Images
2/13	Energy Metabolism in the Brain 1
2/18	Energy Metabolism in the Brain 2
2/20	Cerebral Blood Flow 1
2/25	Cerebral Blood Flow 2
2/27	Brain Activation 1
3/4	Brain Activation 2
3/6	<b>Mid-term Exam</b> (30% of grade )
3/18	Imaging Functional Activity 1
3/20	Imaging Functional Activity 2
3/25	Principles of Tracer Kinetics
3/27	Contrast Agent Techniques
4/1	Arterial Spin Labeling Techniques
4/3	The Nature of the Blood Oxygenation Level Dependent Effect
4/8	Neurovascular Coupling
4/10	Mapping Brain Activation with BOLD-fMRI
4/15	Linearity of the BOLD Signal
4/17	Statistical Analysis of BOLD Data
4/22	Efficient Design of BOLD fMRI Experiments
4/24	Resting-state fMRI 1
4/29	Student Presentation
5/1	MRI demonstration ( Drs. Thomas Neuberger, Chandlee Lab)
	<b>Final exam:</b> date determined by eLion (30% of grade )

NOTE: The class schedule is tentative and subject to change throughout the semester.

**Text book:** Introduction to Functional Magnetic Resonance Imaging, Richard Buxton, Cambridge Univ. Press, 2002. ISBN: 978-0-521-58113-3

**Homework/Project** (20% of grade) assignments, due dates, and submission format will be given in class.

All students enrolled have access to computers with Matlab in 112 Hallowell (Computer room managed by Gary Meyers: gmeyers@enr.psu.edu)

**Office hours:** Tue 3:00-5:00 in W341 MSC.

**Course Objectives:** Gain a basic understanding of MR-based neuroimaging techniques as well as the application of these techniques in addressing current neuroscience research questions.

*Course examination policy and Basis for grades*

**Exams:** Exams are based on reading assignments from the textbook, homework assignments and in-class lectures including lectures given by "guest" instructors. The exam schedule is tentative and subject to change.

**Grade:** Final grade will be given based on the performance of the whole class

**Grade Disputes:** Grade disputes on homework and exams will be settled at the Instructor's discretion. In both cases, the problem in question will be re-graded, making it possible for you to receive a lower score. There is a one-week time period from the return of exams or homework assignments to dispute the grade; after this period the grade is final.

**Attendance** (10% of grade): Attendance will be 10% of final grade. Give notice far in advance whenever possible for missed exams, etc. If this is not possible have a very good and completely solid excuse for missing.

**Final Exam conflict Information:** There are two types of conflict exams, direct and overload. A direct conflict occurs when two exams are scheduled at the same time. Students with a direct conflict must file for a conflict exam. Overload exams are three or more exams scheduled within one calendar day or three consecutive exams. Students may elect to take the overload if they wish. Students may file for direct and overload conflict examinations in the Registrar's office, 112 Shields Building, No conflict exam requests will be accepted after the final date indicated by the Registrar.

In this class, exams will be "open book." For the exams you should bring a working pencil, working calculator. Exams are based on information from the textbook along with lecture material and handouts.

*Academic Integrity Policy*

Please don't lie, cheat, or steal in or out of school.

For specifics on PSU policies related to academic integrity, see <http://www.psu.edu/ufs/policies/47-00.html#49-20>.

Verbatim plagiarism or duplicate assignments, regardless of the semester, will be regarded as cheating.