Term Information

Effective Term	Spring 2015

General Information

Course Bulletin Listing/Subject Area	Psychology
Fiscal Unit/Academic Org	Psychology - D0766
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5425
Course Title	Introduction to Functional Magnetic Resonance Imaging
Transcript Abbreviation	INTRO fMRI
Course Description	A general introduction to the physical bases of Magnetic Resonance Imaging (MRI), the physiological bases and principles of functional MRI, MRI related safety issues, design and analysis of fMRI experiments, and the operation of the Siemens 3T Trio system with hands-on experience.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Permission of instructor or graduate standing
Exclusions	

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	42.0101
Subsidy Level	Doctoral Course
Intended Rank	Junior, Senior, Masters, Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students will learn safety issues in the MRI environment
- Students will learn operation of the Siemens 3T Trio system
- Students will learn the physical bases of Magnetic Resonance Imaging (MRI)
- Students will learn the physiological bases and principles of functional MRI
- Students will learn principles for designing fMRI experiments
- Students will learn basic data analysis techniques

Content Topic List

- 1. An Introduction to fMRI
- 2. MRI Scanners
- 3. Basic Principles of MR Signal Generation
- 4. Basic Principles of MR Image Formation
- 5. MR Contrast Mechanisms and Pulse Sequences
- 6. From Neuronal to Hemodynamic Activity
- 7. BOLD fMRI: Origins and Properties
- 8. Signal, Noise, and Preprocessing of fMRI Data
- 9. Experimental Design
- 10. Statistical Analysis: Basic Analyses
- 11. Statistical Analysis II: Advanced Approaches
- 12. Advanced fMRI Methods

Attachments

- Psych 5425 syllabus.doc: syllabus

  (Syllabus. Owner: Paulsen,Alisa Marie)
- Psych 5425 Concurrence_Form.pdf: Concurrence Dept of Neuroscience

  (Concurrence. Owner: Vankeerbergen,Bernadette Chantal)

Comments

- Instructor has addressed requested changes in syllabus. Concurrence form from Neuroscience was sent to Bernadette Vankeerbergen. *(by Paulsen,Alisa Marie on 02/13/2014 12:53 PM)*
- See 1-17-14 e-mail to Alisa Paulsen. *(by Vankeerbergen,Bernadette Chantal on 01/17/2014 09:52 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Paulsen,Alisa Marie	12/16/2013 04:04 PM	Submitted for Approval
Approved	Vasey,Michael William	12/16/2013 04:50 PM	Unit Approval
Approved	Haddad,Deborah Moore	12/16/2013 05:03 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	01/17/2014 09:52 AM	ASCCAO Approval
Submitted	Paulsen,Alisa Marie	02/13/2014 12:53 PM	Submitted for Approval
Approved	Vasey,Michael William	02/28/2014 04:35 PM	Unit Approval
Approved	Haddad,Deborah Moore	02/28/2014 04:40 PM	College Approval
Pending Approval	Vankeerbergen,Bernadette Chantal Nolen,Dawn Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole Hanlin,Deborah Kay	02/28/2014 04:40 PM	ASCCAO Approval

Psych 5425 Introduction to Functional Magnetic Resonance Imaging

Course Number: # XXXXX
Instructor:

Professor Zhong-Lin Lu
Office: Psychology Building 062
Phone # 614-247-8252
Email: lu.535@osu.edu
Office Hours: 1:00 – 2:00 pm Tuesday

Class Time: 2:15 – 5:00 pm Tuesday
Class Location: PS 0117

Course Description: A general introduction to the physical bases of Magnetic Resonance Imaging (MRI), the physiological bases and principles of functional MRI, MRI related safety issues, design and analysis of fMRI experiments, and the operation of the Siemens 3T Trio system with hands-on experience.

Required Textbook: *Functional Magnetic Resonance Imaging*, by S. A. Huettel, A. W. Song, G. McCarthy, Sinauer Associates, Inc. Sunderland, MA, USA (2004 or 2008).

Course Requirements: The course consists of lecture, lab, and project components. Students are required to participate in ~~ass~~ safety training, and are required to participate in group projects. Safety training consists of a 45-minute course on operating procedures in the high magnetic field environment at CCBBI, and will be provided during the first class meeting. Ideas of group projects will be proposed by students. Two to three topics will be selected. Groups will be organized around the selected topics. Each group will be given 3 hours of scanner time to conduct the experiment. Group members will be expected to participate in designing and executing the experiment, performing data analysis, and presenting the project to the class. There will be a mid-term and a final project presentation. The mid-term will consists of short-answer questions that cover basic concepts of MRI and fMRI. Class grades will be assigned according to the following weights: Class Participation: 10%; Midterm, 30%; Group participation: 30%; Group Project, 30%.

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Grading Scale: Letter (A, B, C, D, E).

Class Attendance Policy: Attendance for this course is mandatory and ~~, although points are not given for attendance~~accounts for 10% of the grade. It is assumed that you will come to class for both lectures and lab sessions. If you are forced by circumstances to miss a class, it is your responsibility to find out what information you may have missed - including both notes from the lecture and any announcements that may have been given in the class you missed.

Academic Misconduct Statement: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student

academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/pdfs/csc_12-31-07.pdf."

Disability Services Statement: "Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/."

Syllabus

Week 1 Lecture 1: Introduction to MRI and fMRI
Lecture 2: Safety training
Tour of CCBBI
Reading: Chapter 1, An Introduction to fMRI, pp 1-30.
Chapter 2, MRI Scanners, pp 31-56

Week 2 Lecture 3: Basic principles of MR signal generation
Lecture 4: Basic principles of MR image formation
Reading: Chapter 3, Basic Principles of MR Signal Generation, pp 57-88
Chapter 4, Basic Principles of MR Image Formation, pp 89-120

Week 3 Lecture 5: Contrast mechanisms and pulse sequences (I)
Lecture 6: Contrast mechanisms and pulse sequences (II)
Reading: Chapter 5, MR Contrast Mechanisms and Pulse Sequences, pp 121-158

Week 4 Lab 1, Patient Registration, Viewing Task Card, Exam Card
Lab 2: Protocol Development + Structural Imaging

Week 5 Lecture 7: Hemodynamic activity
Lecture 8: BOLD fMRI
Reading: Chapter 6, From Neuronal to Hemodynamic Activity, pp 159-192
Chapter 7, BOLD fMRI: Origins and Properties, pp 193-242

Week 6 Lecture 9: Spatial and temporal properties of fMRI
Lecture 10: Signal and noise in fMRI
Lecture 11: Preprocessing of fMRI data
Reading: Chapter 8, Signal, Noise, and Preprocessing of fMRI Data, pp 243-292

Week 7 Mid-Term

Week 8 Lecture 12: Experimental design
Lecture 13: Principles of fMRI data analysis
Reading: Chapter 9, Experimental Design, pp 293-330
Chapter 10, Statistical Analysis: Basic Analyses, pp 331-376

Week 9 Lab 3: BOLD Imaging (block design)

Week 10 Lecture 14: Anatomical analysis with BrainVoyager (Dr. Xiangrui Li, Facility Specialist at CCBBI. ~~Li)~~

– Lecture 15: Block-design analysis with BrainVoyager (Dr. Li)

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Week 11 Lab 4: BOLD Imaging (event related design)

Week 12 Lecture 16: Advanced fMRI data analysis
Lecture 17: Advanced fMRI Methods
Reading Chapter 11, Statistical Analysis II: Advanced Approaches, pp 377-418
Chapter 12, Advanced fMRI Methods, pp 419-442.

Week 13 Lecture 18: Event-related design analysis with BrainVoyager (Dr. Li)

Week 14 Group Projects

Final Presentations of group projects

The Ohio State University
College of the Arts and Sciences Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to course requests. **An e-mail may be substituted for this form.**

An academic unit initiating a request should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should be allowed two weeks to respond.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before this form and all other accompanying documentation may be forwarded to the Office of Academic Affairs.

A. Proposal to review

Psych 5425 Introduction to Functional Magnetic Resonance Imaging

Initiating Academic Unit Course Number Course Title

New

Type of Proposal (New, Change, Withdrawal, or other) Date request sent

Neuroscience

Academic Unit Asked to Review Date response needed

B. Response from the Academic Unit reviewing

Response: include a reaction to the proposal, including a statement of support or non-support (continued on the back of this form or a separate sheet, if necessary).

We support this course. It is timely and needed for the OSU community.

Signatures

		Professor & Chair	Neuroscience	2/6/2014
1.	Name	Position	Unit	Date
2.	Name	Position	Unit	Date
3.	Name	Position	Unit	Date

Return this form to the ASC Curriculum and Assessment Services either through E-mail: vankeerbergen.1@osu.edu or asccurrofc@osu.edu, Fax: 292-6303, or Campus Mail: 154 Denney Hall, 164 W. 17th Ave.
Revised 11/08/10