Interoffice Correspondence

To: Mellon College of Science College Council
From: Department of Biological Sciences
Date: November 30, 2005
Subject: Proposed addition of Graduate Section to MRI course, 03-315

The Department of Biological Sciences requests approval for the addition of a graduate section to the course, 03-315, Magnetic Resonance Imaging in Neuroscience.

A detailed description of the background, rationale and additional graduate level requirements is attached.

Proposed course number: 03-815
Proposed units: 12 units
Proposed semester for addition: Spring 2006
Potential target populations: Graduate students from our Department, the Center for the Neural Basis of Cognition Training Program, Psychology, Computer Science and Biomedical Engineering.
Course instructor: Eric Ahrens

This addition has been approved by the BSC Curriculum Committee and the Departmental faculty.

Carnegie Mellon

Department of Biological Sciences

TO: Biological Sciences Faculty

FROM: Eric T. Ahrens

DATE: 22 October 2004

SUBJECT: Addition of graduate section to Biology 03-315 "Magnetic Resonance Imaging in Neuroscience"

Background

Over the past three years we have offered an undergraduate course entitled "Magnetic Resonance Imaging in Neuroscience." This course is being taught by Eric Ahrens. The aims of this course are to introduce students to the fundamental principles of MRI and its applications in neuroscience. In this course we emphasize the physical, biophysical, and physiological basis of brain MRI, particularly those aspects relating to functional neuro-imaging. The specific topics covered include: introduction to spin gymnastics, survey of imaging methods, structural brain mapping, imaging neurological disorders, and cognitive functional MRI (fMRI). Guest lectures are incorporated into the course from neuroscientists and psychologists who use MRI in their own research. In addition, MRI demonstrations are performed at the Pittsburgh NMR Center for Biomedical Research using animals and at the Brain Imaging Research Center (BIRC) using a student volunteer. Our intent is to require minimal prerequisites for this course so that it can be taken by any student in MCS, as well as students in Psychology, and Engineering. Two textbooks are used in this course, including MRI: the Basics by Hashemi, Bradley, and Lisanti, and Introduction to Functional Magnetic Resonance Imaging by Buxton. All course materials, including PowerPoint lectures, homework, etc., are disseminated via the web-based Blackboard software.

This course has been now been offered for three semesters. A total of 67 students have completed the course for a letter grade. These students come from a diverse collection of majors, including: Biology (28), Engineering (10), the Science and Humanities Scholars Program (7), Psychology (6), Physics (4), Chemistry (4), Business Administration (2), Computer Science (1), Mathematics (1), Statistics (1), the Humanities and Arts Program (1), and other (2). In addition, numerous Postdoctoral Fellows, Staff members, and two Assistant Professors have audited the lectures.

Proposed Changes

Building on the success of this course, I propose cross-listing this course at the graduate level. The course material will be of interest to numerous graduate students at CMU

and Pitt, especially those associated with the CNBC training programs. Many of these students already use MRI in their own thesis research. Last semester three graduate students took this course for credit, and we anticipate that this number will increase if it is offered for graduate credit. We will seek an endorsement from the CNBC training program in order to attract students from this talented pool.

Both the graduate and undergraduate students will attend the same lectures (three hours per week). Additionally, both sets of students will take the same in-class midterm exams (two per semester). The graduate students will be responsible for additional reading and problem assignments from the Buxton textbook (above) and from the primary literature. All graduate level work will be graded on a separate scale from the undergraduates.

The most significant difference between the undergraduate and graduate workload will be in the final course project. In the past, this has been a term paper that accounted for 20% of the final grade. For the graduate course we propose replacing the term paper with an original research proposal written by the student. The topic of this proposal will be mostly left up to the student, but it must relate to MRI in neuroscience. The format for this proposal will be similar to the description provided in the NIH PHS 398 forms, except that the proposal length will be limited to 10 pages. At the end of the course the graduate level student will be required to orally present and defend their proposal in front of a committee consisting of Dr. Ahrens and no less than two additional professors pooled from CMU and Pitt. This final project will constitute 35% of their final grade.

Graduate students will have the option of taking this course for either graduate or undergraduate credit, where the former will require the completion of the additional workload. Alternatively, advanced undergraduates may take this course for graduate credit, but this will require permission from the instructor.