SLHS 8530 Seminar: Cognitive Neuroscience of Speech, Language and Hearing

Fall Semester 2010 (09/07/2010 – 12/15/2010)

Hours: To be determined based on students' and instructor's schedules.

SLHS 8530 is offered once in every two years.

Room: Shevlin Hall 125

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Office Hours: 11:00 – 12:00 WF and by appointment

COURSE DESCRIPTION

This seminar introduces neurophysiological and brain imaging techniques for auditory neuroscience, speech and language research. Selected methods, including electroencephalography/event-related potential (EEG/ERP), MEG (magnetoencephalography), OT (optical topography), and fMRI (functional Magnetic Resonance Imaging), are discussed. Students will gain basic knowledge of cognitive neuroscience of speech and language. The seminar will focus on four main areas: (a) theory, (b) experimental design, (c) data collection, analysis, and interpretation, and (d) issues for studying special populations. Sample research topics include speech perception and music perception, phonological processing, syntactic processing, semantic processing, language acquisition, and bilingualism. Basic tutorials on EEG and ERP software packages will include ASA, BESA, and EEGLAB. Opportunities are also provided for students to gain hands-on experience in EEG/ERP research.

Course objectives

Students in this graduate-level seminar should be able to

- Understand the basic principles, advantages and limitations for neurophysiological and brain imaging methods.

- Select basic EEG/ERP and fMRI designs for various purposes.

- Perform basic EEG/ERP and fMRI analyses using ASA (Advanced Source Analysis), BESA, and BrainVoyager.

- Show that they understand different perspectives on organization of the brain for processing music, speech and language and new findings from brain research on language acquisition and language deficits.

- Think critically about behavioral and brain research methods and design original research outline of their own.

Course Organization

Reading and lab materials are posted and updated online through course web site on a weekly basis. Limited practice with software packages is provided to those who are registered for SLHS 8530. Examples are heavily drawn from speech and language research.

Reference books

Patel, A.D. (2008). *Music, Language, and the Brain.* New York: Oxford University Press.

Luck, S. J. (2005). *An Introduction to the Event-Related Potential Technique*. Cambridge, MA: MIT Press.

Jezzard, P., Matthews, P. M., & Smith, S. M. (Eds.) (2001). *Functional MRI: An Introduction to Methods*. Oxford, UK: Oxford University Press.

Grading

The course grade will be weighted as follows:

Project paper	30%
Presentation	30%
Participation	20%
Lab exercise	20%

On the S-N system, an S is equivalent to A, B, or C (including C-) on the A-F system.

Letter-Numerical Equivalent

A	90 - 100
A-	85 - 89
B+	80 - 84
B	75 - 79
B-	70 - 74
C+	65 - 69
C	60 - 64
C-	55 - 59
D	50 - 54
F =	< 50

In accordance with Senate Policy,
A—achievement that is outstanding relative to the level necessary to meet course requirements
B—achievement that is significantly above the level necessary to meet course requirements
C—achievement that meets the course requirements in every respect
D—achievement that is worthy of credit even though it fails to meet fully the course requirements
S—achievement that is satisfactory, which is equivalent to a C- or better
F (or N)—represents failure (or no credit) and signifies that the work was either
1) completed, but at a level of achievement that is not worthy of credit, or
2) was not completed, and there was no agreement between the instructor and the student that the student would be awarded an I

Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.

The seminar can be taken with Pass/Fail option for grading; a minimum grade of C will be needed to pass the course.

A grade of I is assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. I grades are not given simply because a student fails to complete assignments. A grade of I requires a written agreement between instructor and student.

Readings

Readings for the course will be, in most cases, published research papers or book chapters in which authors describe significant contributions to our understanding of language and related cognitive processes. PDF copies of papers will be provided to the students. Students will be asked to to lead discussion of the papers or book chapters. *The papers should be read with care before the seminar session for which they are assigned*.

Laboratory Exercises

There will be four laboratory exercises. The laboratory exercises will be completed in team work. The laboratory reports will be graded in a 5-point scale.

> 5 – Excellent work. Examples: Student not only learns material but contributes to learning of others by asking questions or making comments that enhance learning. Written assignments are correct, completed on time, and they show evidence not only of understanding of material but also insight, extension of ideas, and curiosity beyond the basic requirements of completion.

> 4 – Good work. Examples: Student completes lab on time. He or she demonstrates understanding of concepts, terminology and methods. Written work is on time, complete, carefully done and nearly errorless.

> 3 - Adequate work. Examples: Student completes lab on time. May not have complete understanding of material but works to learn. Written work is on time, complete. Work may contain some errors or evidence of not understanding exercise.

> 2 - Inadequate work. Examples: Student completes lab late. Failure to demonstrate understanding of basic principles or methods. Written work is partially complete or poorly done.

> 1 – Poor work. Examples: Student completes lab late and provides no justification for late work. Failure to show relevance to the required knowledge and skills to complete the lab. Written work is incomplete.

> 0 – Failure. Examples: No turn-in for the assigned lab exercise.

Term Paper

There will be a term paper (Page limit 15) on a chosen topic of interest (30%). This paper can be a literature review or a proposal of an original study with brief literature review. The literature review should cover at least 10 articles that satisfy the following criteria: (a) they report original experimental studies on speech, language and music processing in the human (or animal) brain; (b) they have a publication date no older than 1960. It is not sufficient to just summarize the main findings of the articles. Instead, discussion should show how findings relate to each other. For example, do the results from different studies point to the same conclusions or different

conclusions? What are some possible explanations for mixed outcomes? What questions should be addressed in the future? Student will be asked to present the paper in class and lead a discussion on the topic. The paper will count 30% of the final grade.

Participation
Attendance and participation in seminar will be evaluated. Emergency situations or circumstances that may result in absence will be considered case by case. Please talk to the instructor about these situations.

ACADEMIC MISCONDUCT

Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.

Please familiarize yourself with the UMN's policy on Student Conduct:
http://www1.umn.edu/regents/policies/academic/StudentConduct.Html
and
http://www1.umn.edu/regents/policies/humanresources/AcademicMisconduct.html

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

It is University of Minnesota policy to provide on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements. Please contact the instructor if you would like to discuss your individual needs for accommodations.

USE OF EMAIL AND COURSE WEB SITE

In accordance with Academic/Administrative Policy 2.2.3, "A University assigned student email account shall be the University's official means of communication with all students on the Twin Cities campus. *Students are responsible for all information sent to them via their University assigned email account and the designated course web site.*

If a student chooses to forward their University email account, he or she is responsible for all information, including attachments, sent to any other email account."

As a matter of good practice, *students are urged to check their UMN Email account and the course web site at least once a week before the seminar.*

THIS MATERIAL IS AVAILABLE IN ALTERNATIVE FORMATS ON REQUEST. PLEASE CONTACT THE INSTRUCTOR IF YOU REQUIRE AN ALTERNATIVE FORMAT.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion,

national origin, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

SLHS 8530 Tentative Schedule for Fall, 2010

Note: SLHS 8530 is offered once in every two years.

Date	Topic (Reading materials will be provided in pdf online and notified by email.)
Week 1	Introduction to Brain Imaging
Week 2	EEG & MEG (Basic Principles)
Week 3	EEG & MEG (Experimental design)
Week 4	EEG & MEG (Hands-on data analysis: basic techniques)
Week 5	OT & fMRI (Basic Principles)
Week 6	fMRI (Experimental design and analysis)
Week 7	Hands-on data analysis: advanced techniques
Week 8	Brain imaging on music and speech perception
Week 9	Brain imaging on music and speech perception
Week 10	Brain imaging on infants and children
Week 11	Brain imaging research on special populations such as autism and dyslexia
Week 12	Brain imaging on selected topics of interest (bilingualism, phonological processing, semantic processing, syntactic processing, etc.)
Week 13	Hands-on EEG data collection and analysis
Week 14	Student presentation of selected topic
Week 15	Student presentation of selected topic
Week 16	Student presentation of selected topic