

Syllabus: PSB4343C: Laboratory in Cognitive Neuroscience

Instructor: Andreas Keil, Ph.D. Professor of Psychology

Email: akeil@ufl.edu

Teaching Assistants: Nina Thigpen, email nthigpen@ufl.edu, and Nate Petro, email npetro@ufl.edu, hold office hours upon request.

Email is the best way to contact me. I hold office hours in the Surge Area Building 772, room 115, Wednesdays at 5:00 to 5:45 PM ([directions are here](#)), my phone is 352-392-2439. Please let me know by email in advance if you plan to see me, so long waits can be avoided.

Course Description:

This laboratory course provides practical training in the foundations of Cognitive Neuroscience, that is, the science of brain and behavior, studied through experiments with human participants. Students will engage in theoretical work and practical experiments addressing behavioral, cognitive, and physiological processes as well as relationships between different biological and behavioral processes. Students will also learn how to report research in line with the requirements of the Publication Manual of the American Psychological Association (6th edition).

Credits: 4

Course Goals:

Specifically, the goals of the course are for students to learn:

- a) about the scientific basis of the study of cognitive processes using behavioral and neuroscience approaches
- b) about key concepts in Cognitive Neuroscience and how they are related to research paradigms
- c) how to formulate a research question and design a valid research study
- d) how to perform example experiments
- e) how to record and analyze behavioral and physiological data with human participants
- f) how to write a scientific report

Literature Used:

Specific readings from the primary research literature, provided on Canvas

Recommended: *Publication Manual of the American Psychological Association* (6th edition).

Recommended for those with no background in experimental/cognitive Psychology: Kathleen Galotti (2007), *Cognitive Psychology In and Out of the Laboratory*, 4th Edition, Cengage. ISBN 9780495099635

Topical outline of subjects to be covered:

(1) Concepts in Cognitive Neuroscience – theory and example paradigms (2) Designing an experimental study (3) The measures of Cognitive Neuroscience (4) Example studies: attention,

perception, language, emotion, motor preparation (5) Analyzing data (6) Writing a research report.

An Overview of the Laboratory:

This course is about how Cognitive Neuroscientists study how the mind, body, and brain work. During the semester, you will play several roles that include being a research participant, research assistant, and research designer. A major portion of this work will be done on computers; some activities will include writing and using small computer programs that will record participants' responses, or analyze the data, so you can see the result of your research study. Programming experience is not required, but you should be aware that **many of these activities require substantial work outside the class periods**. You will need to bring a computing device (a laptop or tablet, smart phones are not as well suited for the purpose) and be able to access the UF wireless internet.

You will explore first-hand many important topics in the science of mind and brain. This year, we will introduce you to a research topic and then you will – with the guidance of the teaching staff – implement a cognitive neuroscience study, analyze and interpret the findings in a small group of students. You will write a few short research reports and one longer report on selected topics, in the same fashion as researchers would do in scientific journals. Each student will also give oral presentations on selected topics. These are designed to simulate the formal talks that scientists deliver at professional conferences and the talks they often give in symposia.

During the first third of the semester, we will mostly meet for presentations, practice sessions, and discussions during the class hours. We discuss the ethics of research using human subjects so that your team can prepare a protocol for the UF Institutional Review Board, which must approve all research involving humans before data collection can begin. We discuss conceptual and methodological issues, give you a review of the statistics that you will need in this course, and study different experimental approaches in cognitive neuroscience, with the goal of enabling you to ultimately design your own studies. You will get exposure to the standard designs in Cognitive Neuroscience through readings, discussions and short quizzes on readings and youtube clips, which earn you points towards your grade. In the second third, students will begin to work on experimental studies on selected topics and learn about implementing and evaluating original research. **Thus, it is very important that you come to class regularly and carefully review the week's assignments for the lab before you come to lab.** You will work as a research participant in your experiment, in the process learning about the logic and ethics of neuroscience research from all perspectives while, at the same time, providing data that students (including you) who act as experimenters will use. This means, of course, that you (as part of a small group) will also be collecting data—from EEG sensors placed on the participant's head. Your responsibilities include doing everything that is necessary to be able to understand the experiment (the research context, the methodology, and the data) in sufficient detail to be able to explain one aspect of it to the rest of the class in the form of a 10-minute oral presentation. Your oral presentations will be scheduled according to the time line in this syllabus, so you have plenty of time to do your work.

The last third of the semester is devoted to *analyzing the data and write up a paper*. This is the time that you get to practice everything that you have learned in this class and in the classes that

are prerequisites for this laboratory. Once data collection begins, we suspend class for a couple of weeks so that instructors can devote at least one hour of class or lab time each week to meet with each team to discuss its progress, problems, data, and analyses, and to help put its findings in perspective.

Heads up! The time between when you conduct your experiment and your presentation of your results experiment will be extremely labor-intensive, so make sure that you block off a *significant* amount of time during this period.

On the last lab day of the semester, we hold our final conference. In this informal atmosphere, each team discusses what they have accomplished and learned from their team effort.

Assignments and Grades:

These are the components of your grade (1 point is 1%)

- A written IRB document (either an informed consent form or a protocol) -- 5%
- 1 written abstract (250 words) on a hypothetical study that you design -- 5%
- 5 short Quizzes on key readings (readings are provided on Canvas) -- 15%
- A short power point presentation on a selected EEG study-- 5%
- A presentation on one aspect of the planned group research (symposium 1) -- 5%
- A group presentation on one aspect of the final research results--15%
- A research paper on your research results--30%
- Overall participation in the class (and final symposium) and as member of your team -- 20%

Letter grades are in keeping with the UF grading policies (<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>) and are assigned on the following basis:

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-
% points	96-100	91-95	86-90	81-85	76-80	71-75	66-70	61-65	56-60	51-55	46-50

Note: I am informed that a grade of C– is not a qualifying grade for major, minor, Gen Ed, or College Basic distribution credit.

Attendance and Make-up Assignments:

Quizzes (on Canvas) are due at the *beginning* of the class period indicated in the list below. Each day or fraction of a day that a written assignment is late (unless there is a medical reason) carries a 50% penalty. This course is extremely labor intensive for you and for us. We will do our best to provide you what you need to do your assignments during class and lab times. **If you do not come to class or lab, you are going to get behind very quickly.** More than one unexcused absence will be considered unacceptable, and will influence our assessment of the 20% of the course grade allocated to overall participation. An absence is considered *excused* if there is an *acceptable reason* according to UF policy (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>), and make-up activities can be arranged when necessary if they are missed due to an acceptable reason.

Academic Honesty: Academic integrity will be strictly encouraged. Plagiarism – as any form of copy/paste from work not originating by the student- is not tolerated in academia, and in the present class will lead to loss of points for a given assignment of activity. Please review and be familiar with the Student Honor Code, which can be found at <http://www.dso.ufl.edu/scer/honorcodes/honorcode.php>.

Accommodations for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. Contact the Disability Resources Center (<http://www.dso.ufl.edu/drc/>) for information about available resources for students with disabilities.

Timeline of the laboratory: Activities that directly result in points towards grades are **highlighted in red** or **blue** (readings, assignments, and texts written in class) ...

!!! IMPORTANT: This class is a bit like graduate/professional training in that you will be asked to perform professional activities that are outside our control, such as the UF ethics training online, do literature search, use a “real lab” etc. **IF SOMETHING DOES NOT WORK** (cannot log on, door locked, out of forms, EEG broken), do not panic, but let us know right away ☺, there is always a way.

Week	Dates	Topics/activities	Quizzes on readings (in Canvas) and youtube videos (always to be completed by the class period on the day indicated) and other deadlines and assignments/papers (due dates indicated below)
0	08/22 08/24	Overview of the class; discussion of syllabus; No class - instead we would like you to start with the readings, so you are informed about the course content (also check out this syllabus) and can elect to take another class is this one is not for you.	No quizzes Read posner.pdf
1	08/29 08/31	No class - but due date for the Quiz on the Posner.pdf reading, plus complete IRB required online training UF_PRV801_OLT 1) Form research teams 2) Overview and practice: Written materials needed to get a CogNeuro research study with human subjects off the ground: Runsheets, SOPs, questionnaires, informed consent forms..	Quiz 1 on Posner.pdf reading due today Read Teplan.pdf and watch https://www.youtube.com/watch?v=1ovv6lmPHSI (due in one week, thursday) Assignment (due today before class) http://mytraining.hr.ufl.edu , go to Univ Florida, enter UF_PRV801_OLT in “activity search field” and register/complete. If you have trouble, let us know, but do not panic (see above)...

2	<p>09/05 The Cognitive Neurosciences in the laboratory: Interactive overview of the tools and skills we need to conduct research of brain and behavioral processes in humans.</p> <p>09/07 1) Introduction to EEG recordings. Theory, physiology, practical aspects of recording and analyzing scalp-recorded brain potentials. 2) Writing workshop #1: Ethics in research – how to write an IRB protocol and ICF. Write a protocol and Informed consent for this study: https://www.youtube.com/watch?v=6soHq8jAR_E</p>	<p>Quiz 2 on Teplan.pdf and this movie: https://www.youtube.com/watch?v=1ovv6lmPHSI due today</p>
3	<p>09/12 Lecture and hands-on workshop: Designing experiments: Control, manipulation, repeated trials, and balanced conditions. Application to studies with brain recordings.</p> <p>09/14 Interactive practice sessions. Experimental approach to studying the working human brain and body. How to use Brain Voyager Brain Tutor. How to use the BESA dipole simulator.</p>	<p>Read Thigpen.pdf (due in two weeks)</p> <p>Due date: send your IRB document to Dr. Keil by email: akeil@ufl.edu before the class period starts.</p>
4	<p>09/19 Writing workshop #2: Elements of a scientific report. Write an abstract, and a brief results section.</p> <p>09/21 Statistics workshop #1: Research design and the traditional statistical foundations of experimental research: T-test. Analysis of variance. Evaluate sample data and data from a standard experiment.</p>	<p>Email the abstract from writing workshop#2 to akeil@ufl.edu by today's class period.</p>
5	<p>09/26 What is dense-array EEG and what is alpha power?: Introduction to the concepts of in-vivo neurophysiology with brain oscillations.</p> <p>09/28 Recording dense-array EEG: Practical introduction. Research teams arrange 45 minute time slots with instructors.</p>	<p>Quiz 3 on Thigpen.pdf due today Read Lang1979 (due in next week, tuesday)</p>
6	<p>10/03 How to find literature and present it (and your own science). Example literature search and presentation on a published EEG study of your choice.</p> <p>10/05 EEG analysis: How to get from the raw recording to brain waves. An example analysis.</p>	<p>Quiz 4 on Lang, 1979 Read Bartsch et al (due next week, tuesday)</p> <p>Email the presentation from tusday to akeil@ufl.edu by 11:59 PM on 10/05</p>
7	<p>10/10 What is our study going to be? The many faces of alpha waves. Imagery as active memory. How to draft outline of introduction of final paper.</p> <p>10/12 No class</p>	<p>Quiz 5 on Bartsch et al. pdf</p>
8	<p>10/17 Discussion of conceptual background; draft outline of Introduction and Procedure section of final paper.</p> <p>10/19 Symposium 1: Group presentations and discussion about the planned group research – each research team presents a power point on either Background, Hypotheses, or Methods.</p>	
9	<p>10/24 Quantifying alpha power during imagery - Data reduction and analysis: review and practice</p>	

	10/26	Final preparation of our study, get materials ready, answer final questions; meetings with instructors during class period in the EEG lab. Complete a test run.	In the following three weeks, no regular classes will be held, but we will work with you individually in the lab by arrangement.
10	10/31 11/02	Time for running experiments - no class Time for running experiments - no class	
11	11/07 11/09	Time for running experiments - no class Time for running experiments - no class	
12	11/14 11/16	Time for running experiments - no class Time for running experiments - no class	
13	11/21 11/23	Thanksgiving break Thanksgiving break	
14	11/28 11/30	How to write the results and discussion of the final paper- organization and content. Final conference with group presentations of theory, methods, results, discussion	
14	12/05 12/11	Instructors provide assistance with writing the final paper, during class periods, if needed. Deadline for submitting the final paper	<i>Email the final presentation and the final research paper to akeil@ufl.edu by 11:59 PM on 12/11</i>