EEG and Sleep Research Methods Bootcamp!
May Experience 2019

FURMAN Sleep LAB

Dr. Erin Wamsley
erin.wamsley@furman.edu
Johns Hall 206K
May/Summer Office Hours by appointment only

Course Description

Welcome to the Furman Sleep Lab. This May Experience is centered on a hands-on scientific project that will give you an intensive introduction to research using the electroencephalogram (EEG), and to the use of polysomnography (PSG) to study human sleep. You will learn the fundamentals of EEG data collection and analysis through a mixture of instruction and actually doing it yourself. We will also be reading and discussing technical articles, theoretical articles, and research papers in an effort to educate ourselves about how EEG can be used as a tool to understand the mind and brain. **The meat of the experience will arrive during the second half of the course, as students work together in small groups to design, execute, and analyze data from a (real) EEG experiment.**

Requirements

1. **Participation, Participation, and more Participation**
   The quality of this class is determined by YOU: by how well prepared you are, how freely you are willing to struggle with difficult readings and concepts, how fully engaged you are in our collaborative project, and by the initiative and leadership you bring to the experience. Make it happen!! You are expected to:
   a. Keep up with a challenging selection of readings.
   b. Contribute your questions, ideas, frustrations, understandings and insights during our meetings.
   c. Assist in leading discussion of the readings.
   d. Throw your full effort behind productively and positively working with your classmates on a scientific research project that you will design and conduct, largely outside of class meetings.
   e. Take charge of your own learning experience: speak up, be proactive, solve problems, make suggestions, take initiative. In this class, we will all be SCIENTISTS, not STUDENTS.

2. **Completion of a Reflection Paper**

   At the end of MayX, you will complete a short (2 page) reflection paper, evaluating your own participation in the course, and describing what you did (and did not) learn from the experience. These papers will be used to help me in determining your participation grades, and will also serve as valuable feedback for me in designing future years of the course.

3. Completion of a Research Report

Based on the outcome of our project, students will each prepare a brief (<5 pages) research report describing 1) what we did, 2) what we found (or not), and 2) what we think it means. I will provide further guidance on preparing this report as we progress.

Format of the Class

In the initial days of the class, there will be some lecture given by Erin (yes, you can call me Erin, although I will also respond to "Dr. Wamsley"), in combination with hands-on learning activities. Over time, this will give way to more independent hands-on practice and experience, and then to independent work on actual data collection and analysis. Because of the nature of this research experience, we may not always meet "in class" for the full 4hrs/4days per week time allotted.

Attendance Policy

Class attendance is required -- Please realize that for this course, missing even one class meeting could leave you seriously lost and behind. In this course, in-class participation forms the core of the class experience. You may miss up to two class sessions without a penalty to your grade. After this, each absence will deduct 2 points from your grade for the course.

Academic Honesty Policy

You will are responsible for understanding and following Furman University's academic honesty policies. Ignorance of any of these policies is not a defense. Any written work in this course is expected to be your own. Using information from other sources (like a journal article or the internet) without citing this information is plagiarism. If you plagiarize your work you will automatically receive zero points for that assignment. Serious or repeated cases of plagiarism will result in failure of the course. All cases of plagiarism will be reported to the academic dean, and could result in further penalties at the University level. Helpful information on plagiarism can be found on our library website at: https://libguides.furman.edu/citing/plagiarism. If you have questions about how to properly cite your sources, ask! The course Moodle site also includes links to information about referencing the work of others.

Grading

Your grade for the course, heavily weighted on participation, will be determined as follows:

In-Class Participation	35 points
Research Article Presentation	5 points
Out-of-Class Participation in Group Projects	40 points
Research Report Assignment	20 points
	(Total = 100 points)

90-100 points = A; 80-89 points = B; 70-79 points = C; 60-69 points = D; below 60 points = F

Course Outline

Refer to the Course Moodle Site for Readings to Accompany Each Topic/Day

May 15th
Introduction to Neurophysiological Basis of the EEG Signal (e.g. "What are all those wavy lines?")
    A. Understanding the EEG signal and its use in cognitive neuroscience
    B. Our first EEG recording!
    C. Tour of the Lab/Orientation; How to start an EEG recording on the lab equipment; Lab Safety Procedures

May 16th
Applying Electrodes and Interpreting EEG
    A. Sleep Staging Tutorial
    B. Group Practice with *Twin / Recorder* and *Brainstorm*
    C. Independent Practice
        1. Sleep Staging Practice in *Brainstorm*
        2. PSG Hookup in the Lab & Practice Recording

Over the Weekend of May18th-19th: Come to the Lab and Practice Doing a Hookup on Your Own as Best You Can
Text Photos to Erin. Nerdiest Photo Wins.
Human Subjects Training and New Researcher Quiz due by May 20th

May 20th
Practice Recording & Data Preprocessing
    A. Practice Hookup in Groups
    B. Introduction to Data Pre-Processing
    C. Hands-On Data Preprocessing in *Brainstorm* – Data Selection, Filtering & Artifact Rejection

May 21st
Introduction to Signal Processing Concepts using MatLab and Brainstorm
    A. MatLab Basics
    B. Signal Processing Basics
        1. Filtering
        2. Spectral Analysis
    C. Sample Data Analyses in *Brainstorm*

May 22nd
Review Past Work in This Area and Begin Our Study Design
    A. Graelyn presents our last study on this topic
    B. Discussion of Research Studies
    C. Begin Discussion our Study Design(s)

May 23nd
Start Designing Our Study(ies)
    A. Designing and Planning our Data Collection Project(s)
    B. Tips & Procedures for Running a Good Study

<u>Over Memorial Day Weekend</u>: Complete a draft study protocol and send to Erin by Monday the 27th
                         Rehearse all aspects of your protocol that you can

May 28th

Finalizing Study Design
  A. Designing and Planning Discussion, continued
  B. Erin, Graelyn and other lab members will help you with whatever additional training and information you need to make your idea a reality
  C. Run-through of study procedures / Collect practice subject data

May 29th

Preparing the Data Analyses
  A. In-Class Preprocessing of Initial Data
  B. More Detailed Discussion of Analysis Plan for your Specific Ideas

May 30th-June 3rd (ish)
DATA COLLECTION!!

June 4th

Analysis and Writing Workshop 1 – Erin helps you with your analyses and how to write the paper

June 5th

Analysis and Writing Workshop 2– Erin helps you with your analyses and how to write the paper

Research Report and Reflection Paper due June 6th by Midnight – Extensions are Literally Impossible