

IDH 3035 (U38): The Biophysics of Neural Computation – Data Evaluation

Instructor: Dr. Jorge Riera Diaz, PhD

Phone: (305) 348-4948

Email: jrieradi@fiu.edu

Department of Biomedical Engineering

Office: EC 2678

Office Hours: 11:00am-12:00am, Monday

Period: Jan 9th, 2017 – Apr 22, 2017

Classroom: Graham Center 273B

Time: TuTh 2:00PM - 3:15PM

Course ID: 020951

Class Number: 12400 (Regular Academic Session) - 3 units

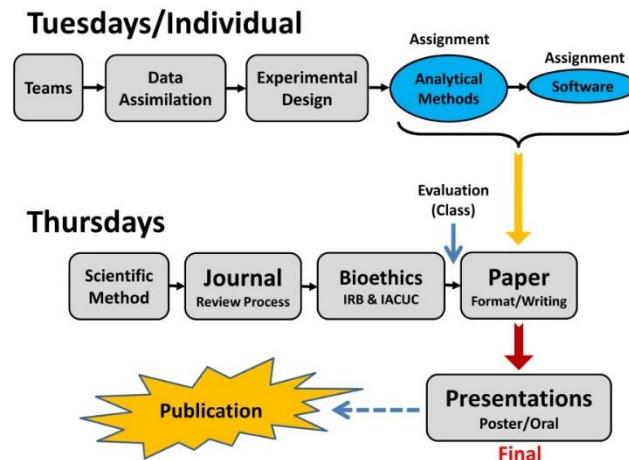
Period: Jan 8, 2018-Apr 21, 2018

Course description

This course will provide you all elements needed to perform a Scientific Research in the area of Neuroscience (Figure). The course includes important elements in the process of publishing a research in a Scientific Journal and Bioethical Aspects of it. In the first part of the course, we will discuss the foundation of the scientific method, and by using examples, teams will create a research proposal. During the semester, you will learn Different Methods for the analysis and interpretation of neuroscience data. Students will be grouped in teams of 3 members. At the end, data recorded by particular laboratories at FIU will be provided to each team for data analysis. Results from this analysis will be presented in a Mini-Conference. Each team will submit a publication at the end of the semester.

Course Outcome:

No.	Course Learning Objectives By the end of this course, students should know:
1	Critical aspects while performing a scientific research
2	Different software for data analysis in neurosciences
3	How to write a scientific paper
4	The path for publication of a research study in a scientific journal



Prerequisites

This course is only available for Honor College Students:

- Prerequisite: IDH 3034 (U38)

Textbooks (Recommended, not mandatory)

NA

Grading

15% Assignments (2), 1% of the total grade will be deducted for assignments turned in late

- 1- Propose a small research project in teams
- 2- Write a 4 page report about this research project

30% Software Evaluation (SPM, BrainStorm, CSDplotter and WaveClus)

35% Final Report (10 page publication)

20% Poster Presentation (Mini-workshop)

Grading scale: 95-100 A; 90-94.9 A-; 86-89.9 B+; 82-85.9 B; 79-81.9 B-; 76-78.9 C+; 72-75.9 C; 69-71.9 C-; 67-68.9 D+; 63-66.9 D, 60-62.9 D-

Grade	Points Per Credit Hour
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
D	1.00
F	0.00

Assignments

Assignment 1 – Students will create a team of 3 members. Each team will discuss multidisciplinary elements, major strengths and major weaknesses in it. Each team will discuss a small research project in class.

Assignment 2 – Each team will write a 4-page report about the research project in Assignment 1. The report should include the following elements: Abstract, Introduction, Material and Methods, Results, Discussion, Conclusion and References.

Software Evaluation – After learning how to use four different software (SPM, BrainStorm, CSDplotter and WaveClus) for neuroscience data analysis, you will demonstrate your skills by solving specific problems in from of the instructor.

Attendance

Attendance is mandatory but up to three classes can be missed without incurring penalties. However, a formal justification note should be provided to the instructor by email.

Religious Holidays

Every effort will be made, where feasible and practical, to accommodate students whose religious practices coincide with class requirements scheduling. Please make sure to notify your instructor at the beginning of the semester of which dates you will be absent or any anticipated problems with completing course work.

Physical, Mental and Sensory Challenges

Every effort will be made, where feasible and practical, to accommodate students who are so challenged. Should you require accommodations, contact the Disability Resource Center (DRC), if you have not done so already.

Information for Honor Students

Global Learning Graduation Honors

FIU's Excellence in Global Learning Graduation Medallion is awarded to students who complete at least four global learning courses, participate in a variety of global co-curricular activities, and complete a capstone consisting of one of the following: a substantial original research project and presentation on a global topic; extensive foreign language study; long-term study abroad; or, a globally-focused internship. The Peace Corps Prep certification is conferred upon students who complete at least four global learning courses, extensive language study, and a global problem-solving project. For more information, visit goglobal.fiu.edu.

1. *Global Awareness: Students will learn about the history of neuronal computation and how multiple scientists from different parts of the world have contributed to the understanding of the most integral principles in the field.*
2. *Global Perspectives: Students will learn about different international approaches towards the search for medical advances in the field of neuroscience (i.e. Human Brain Project in Europe vs. BRAIN Initiative in USA).*
3. *Global Engagements: Students will introduce themselves and work together by combining different disciplines in science and form relationships with peers that come from distinct parts of the world, each with unique backgrounds and career paths.*

Honors College Requirements

Registration in this course implies an acceptance of and compliance with the Honors College policies for students and the FIU Code of Academic Integrity.

Honors Citizenship Requirements

Beginning in Fall 2014, Honors College students are required to accumulate at least **20 citizenship points** each academic year (Fall and Spring) by attending Honors College activities. Students attending only one semester (Fall or Spring) are required to accumulate **10 citizenship points**. See <http://honors.fiu.edu/academics/policies/citizenship/>.

Student Portfolios

The Honors College will be using a portfolio method to assess students' learning outcomes. The portfolio allows for maximum flexibility in gauging student learning. Students decide (with instructor consultation) what "artifacts" or assignments to include for consideration in their portfolios to demonstrate successful achievement of each of five key student learning outcomes over the 4-year Honors experience. See www.honors.fiu.edu/portfolios.

Honors Education in the ARTS (HEARTS)

The HEARTS program is designed to give Honors College students opportunities to "explore and appreciate different artistic and cultural traditions and modes of artistic expression. HEARTS will also serve as a clearinghouse (and curatorial framework) for our students to experience the arts on campus and in the community by providing them with information about cultural activities and access to performances with free or discounted tickets.

See <http://honors.fiu.edu/hearts/>.

Honors College Academic Misconduct Statement

In The Honors College, the term "honor" refers both to academic accomplishment and character. Students in Honors should therefore adhere to and be held to the highest standards

of personal academic accountability. Academic dishonesty in any form, including plagiarism, is antithetical to the very definition of being an Honors student at FIU. Consequently, an Honors College student found responsible for academic misconduct will be dismissed from the College.

Procedures and Penalties

An Honors faculty member may bring charges of academic misconduct against an Honors student if the faculty member suspects plagiarism or other forms of academic misconduct. The faculty member will decide whether to pursue informal resolution, file formal resolution charges, or take no further action, and will follow the procedures outlined in the Honors College website (<http://honors.fiu.edu/academics/policies/>), and the Academic Misconduct Procedures, available at <http://integrity.fiu.edu/misconducts.html>.

Please refer to the following documents for additional information:

- FIU Code of Academic Integrity – <http://www.fiu.edu/~dwyere/academicintegrity.html>.
- FIU Honors College Student Handbook – <http://honors.fiu.edu/students/policies/>
- FIU Honors College Plagiarism Policy – <http://integrity.fiu.edu/misconducts.html>
http://honors.fiu.edu/current_policy_plagiarism.html Courses designated as Global Learning courses (IDH 3034-3035) must list specific Global Learning outcomes. Assignments must be able to assess the students' ability to demonstrate these outcomes. Questions on Global Learning should be addressed to Jose Rodriguez, rodrije@fiu.edu.

Tentative schedule (subject to change to better address goals)

Tuesdays

L1: Introduction

- *Syllabus & Class Schedule*
- *Project Definition*
- *Team Formation*
- *Assignment 1 (Team Characteristics, 5 Points)*

L2: The Scientific Method

- *Theory & Concepts*
- *Humans Hair Evolution (Discussion in Class)*
- *Assignment 2 (4-Page Paper, 10 Points)*

L3: Publication Process

- *The Impact Factor*
- *Predatory Journals*
- *Researcher Indexes*

L4: Project 1

- *Definition*
- *Data Structure*
- *Experimental Design*
- *Timeline*

L5: Project 2

- *Definition*
- *Data Structure*
- *Experimental Design*
- *Timeline*

L6: Project 3

- *Definition*
- *Data Structure*
- *Experimental Design*
- *Timeline*

L7: Project 4

- *Definition*
- *Data Structure*
- *Experimental Design*
- *Timeline*

L7: BrainStorm Evaluation (10 Points)

L8: WaveClus & CSD Plotter Evaluation (10 Points)

L9: Paper Writing

- *Publication History*
- *Paper Format*
- *References*

L10: Per-Review Process

- *Paper Submission*
- *Importance and Roles for Reviewers*

- *Publishers*
- *Class Exercise (Review – 4-Page Paper)*

L11: Bioethics in Research

- *IACUC*
- *IRB*
- *IBC*

L12: Poster Preparation

- *Poster Format*
- *Presentation Skills*
- *Q&A*

Thursdays

L1: MRI Technique

- *MRI Physics*
- *Software*
- *SPM Data Structure*

L2: MRI Data Analysis (Part 1)

- *SPM Data Preprocessing*
- *Data Co-Registration & Normalization*

L3: MRI Data Analysis (Part 2)

- *BOLD Signal Analysis*
- *Model Estimation*
- *Results Visualization*

L4: SPM Evaluation (**10 Points**)

L5: EEG and MEG Techniques

- *EEG & MEG Sensors/Equipment*
- *Forward and Inverse Problems*
- *Mechanisms of Data Genesis*
- *Software*

L6: EEG & MEG Data Analysis

- *BrainStorm Structure*
- *Anatomical Modeling*
- *Forward and Inverse Problem*

L7: Intracranial Techniques

- *Microelectrode Array (MEA)*
- *Multi-Unit Activity (MUA) and Spike Sorting (WaveClus)*
- *Local Field Potentials (LFP) and Current Source Density (CSD) Analysis (CSDplotter)*

L8: Presentation Team 1 (1 week after: Paper Submission, **35 Points**)

L9: Presentation Team 2 (1 week after: Paper Submission, **35 Points**)

L10: Presentation Team 3 (1 week after: Paper Submission, **35 Points**)

L11: Presentation Team 4 (1 week after: Paper Submission, **35 Points**)

Final Exam: Poster Presentation (20 Points)