

YORK UNIVERSITY
FACULTY OF HEALTH
PSYCHOLOGY 3010 3.0 M
INTERMEDIATE RESEARCH METHODS:
Neuronal recording and analysis techniques
WINTER 2016

Time: Th 8:30-11:30
Classroom: BSB159
Course Webpage: moodle.yorku.ca

Course Director:

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TA:

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Prerequisite: AK/AS/SC/PSYC 1010 6.00 or AK/PSYC 2410 6.00, with a minimum grade of C; AK/AS/SC/PSYC 2030 3.00 or AK/PSYC 2530 3.00; one of AK/AS/SC/PSYC 2020 6.00, AK/AS/SC/PSYC 2021 3.00, AK/PSYC 2510 3.00. Degree credit exclusions: AK/PSYC 3180 3.00. Note: Not open to students who have passed or are taking AK/AS/SC/PSYC 4000 6.00, AS/SC/PSYC 4170 6.00, AK/PSYC 4700 3.00, or AK/PSYC 4800 6.00

General Description:

Building on the foundation established in AK/AS/HH/SC/PSYC 2030 3.00, the course further prepares students for advanced research and honours thesis projects. The primary goal is to provide further experience with the design, execution, analysis, interpretation and communication of psychological studies, with an emphasis on neural recording and signal processing. Students will become familiarized with the acquisition and analysis of neural and physiological time series data and write up abstracts based on these data using SFN meeting guidelines.

Textbook: Materials will be provided. Reference texts include:

Analyzing Neural Time Series Data, Theory and Practice. (2012). Mike X Cohen. The MIT Press.
MATLAB for neuroscientists (2009) Wallisch et al.; AP
Getting started with MATLAB Version 7

Evaluation:

Class attendance and participation	10%
In-class computer exercises	15%
Problem sets (lab task)	40%
Interim project	15%
Final project	20%

Weekly Schedule:

INTRODUCTORY MODULE	
7	Introduction to measuring neural signals and getting started with MATLAB: Logistics, practice “how to do’s” of MOODLE and MATLAB, data types
14	Introduction to techniques: neural recordings and data structures
21	Continuous and discrete sampling of signals, neural data entities
28	Evaluation and Visualization: computer lab MATLAB plotting and data exploring basics
TIME DOMAIN MODULE	
Feb 4	Perception methods I, Signal processing basics: peaks, troughs, baselines, onsets
11	Perception methods II: rates of change, filtering
18	<i>Reading Week—no class</i>
	Interim project due Feb 22
25	Decisions: reaction times, skewed data, missing data, artifacts
Mar 3	Decisions: brain predictors of decisions
FREQUENCY DOMAIN MODULE	
10	Power analysis
17	Phase analysis
24	Supervised work on project
31	Supervised work on project
	** Final project due April 3**

Interim project

For the interim project, you will be given a dataset and partial code for analyzing and plotting the data. You will be asked to add your own code where indicated, to complete the analysis and plotting routines.

Final Project

For the final project, you will be given several options of increasing mastery and therefore of increasing maximal marks. The highest final project mark of A+ will require plotting the results of independently-written analysis code, from data provided to the student.

Course Goals: This course is designed to further your skills in experimental design and execution. We will introduce you to methods that measure the neural signals associated with different mental and behavioral phenomena. As a group, we will learn about how to conduct neural recordings during different behavioural tasks, with examples of data collection/analysis.

This a laboratory course; during class periods you will be required to take part in data analysis exercises. To prepare you for particular labs, it will be necessary for some class time to consist of lectures/discussion in which the background material for the laboratories will be provided.

I hope this course will imbue you with basic observational, critical thinking, and computer skills that will serve you well regardless of your future endeavors. We will work in MATLAB which is the most common data analysis software for signal processing in neuroscience, and should be useful if or when you seek an honours thesis supervisor. You will also learn how to present your results visually, by plotting figures.

Important Information for Students

The information in the following section has been taken from the Senate Committee on Curriculum & Academic Standards webpage. All students are expected to familiarize themselves with the following information

(available online at http://www.yorku.ca/secretariat/senate_cte_main_pages/ccas.htm)

York's Academic Honesty Policy and Procedures/Academic Integrity Website

York students are required to maintain high standards of academic integrity and are subject to the Senate Policy on Academic Honesty. Students are expected to review the materials on the Academic Integrity website: <http://www.yorku.ca/academicintegrity> I strongly encourage you to complete the Academic Integrity Tutorial http://www.yorku.ca/tutorial/academic_integrity/

Access/Disability

- York provides services for students with disabilities (including physical, medical, learning, and psychiatric) needing accommodation related to teaching and evaluation methods/materials. Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided. Information is available at <http://www.yorku.ca/disabilityservices>

Religious Observance Accommodation

- York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict to you, contact the Course Director within the first three weeks of class. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre, or online at http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf

Student Conduct

- Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect and to refrain from actions disruptive to such a relationship. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. A statement of the policy and procedures involving disruptive and/or harassing behaviour by students in academic situations is available on the York website: <http://www.yorku.ca/univsec/policies/document.php?document=82>

CHEATING/PLAGIARISM

- The University does not look favourably on cheating of any kind – the penalties are harsh indeed. Become familiar with the rules and regulations regarding cheating/plagiarism published in the University Calendar. See the University Calendar for more detail.