CISC 3250 Systems Neuroscience
Department of Computer and Information Science
Prof. Daniel D. Leeds, Spring 2017

Class times: Monday and Thursday, 10:00 – 11:15am, JMH 342
Instructor: Prof. Daniel D. Leeds
Office: JMH 332
E-mail: dleeds@fordham.edu
Office hours: Monday 11:30am-12:30pm, Thursday 4:30-5:30pm

Course website: http://storm.cis.fordham.edu/leeds/cisc3250/

Texts:

Suggested: "Fundamentals of Computational Neuroscience", T.P. Trappenberg, Second edition, 2010.

While the **Trappenberg** text is quite good, it also uses a lot more math than we will require in the course. Throughout the semester, I will highlight and explain the equations to study, and focus on conceptual understandings of what these equations are trying to capture.

Further optional: "Computational Cognitive Neuroscience", R.C. O'Reilly et al., First edition, 2012. http://ccnbook.colorado.edu

The O'Reilly text provides another set of perspectives and illustrations on several (but not all) important topics we will cover throughout the semester. It is conveniently available for free online in its entirety.

Course description: This course studies information processing in biological neural systems from computational and anatomical perspectives. Components of natural intelligence, such as visual perception, learning, memory, and motion, are modeled as achieved in the brain. Artificial and biological neural networks are considered and compared, spanning from tens of neurons to networks of regions collaborating across the brain. Data analysis methods also are pursued, to quantify the activities of neural systems and to connect to the growing field of brain-machine interfaces.

Objectives: To understand information processing in biological neural systems from computational and anatomical perspectives. A student who successfully completes this course will be able to:

- Identify the functions of key components of the nervous system
- Model how neurons interact with one another
- Use computational tools to examine neural data

Software: Assignments will include the use of Matlab, an environment for numeric analyses and computational modeling. It will be available in the computer lab (JMH 330) and I recommend you download the Student version from the Mathworks web site for $50. We will learn how to use this program in class.

Attendance and class participation: It is important to attend every class, and to arrive on time. One unexcused/unexplained absence is permitted for the semester. Attendance will be taken regularly. Please *actively* participate in class since this will make the course more interesting for everyone! Ask questions if you are unsure about something.

Course assignments: There will be roughly 5 homeworks assigned for the course. The homeworks usually will be announced at least 4 days before they are due, e.g., a homework announced on Thursday may be due the following Monday. (Usually you will have a week advanced notice.) All assignments must be turned in on time.

Academic honesty: All work produced in this course must be your own unless it is specifically stated that you may work with others. You may discuss the assignment problems with other students generally, but may not provide complete solutions to one another. Copying of any part of an assignment is never acceptable and will be considered a violation of Fordham's academic integrity policy. Violations of this policy will be handled in accordance with university policy which can include automatic failure of the assignment and/or failure of the course. See Fordham's Undergraduate Policy on Academic Integrity for more information.

Exams: There will be two mid-term exams -- one in February, one in April -- the exact dates will be announced at least 3 weeks in advance of the exam. There will be a final in May.

Timing conflicts: If you have a significant issue and cannot complete an assignment on time, or cannot attend class on a certain day, whenever feasible let me know beforehand -- I tend to be reasonable in such cases. Examples of significant issues include personal illness (with doctor's note) or a religious holiday (give me at least a week's notice) on an announced exam day. In general, let me know of any significant issues that affect your performance early on.

Grading: The percentages given below are guidelines for both the student and instructor and may be changed as needed to reflect circumstances in the course. Any changes that occur during the semester will be minor.

Participation	10%	Mid-terms	40%
Homeworks	25%	Final exam	25%

Tentative schedule

Schedule is subject to change as the class progresses. The last few days are scheduled as "catch-up" days as it is likely we will run behind at some point as the semester progresses. If we are **ahead** of schedule, I will add some additional topics.

January 19	Overview, levels of modeling, neuron biology and behavior	
January 23-26	The neuron – biology and behavior	
January 30 - February 9	Learning in the neuron; Introduction to Matlab	HW 1 due
February 13-23	Functional neuroanatomy; neural coding	HW 2 due
February 27 – March 9	Perception	Exam 1; HW 3 due
March 13-16	SPRING BREAK	
March 20 – April 3	Memory; Matlab – matrices and graphics	HW4 due
April 6-10	Motion; Matlab – loops and correlations	Exam 2
April 13-17	EASTER BREAK	
April 20-24	Motion and Matlab continued	HW 5 due
April 27 - May 4	Catch up days	