ANALYZING PHYSIOLOGICAL SYSTEMS: PHGY 425

Course Outline
Fall 2009

Time: Thursday and Friday from 2:35 p.m. to 3:55 p.m.

Location: McIntyre Medical Building, Rooms 409 (4th Floor), 1101(11th Floor) & 803 (8th Floor)

Course Coordinators:

Dr. M. Chacron (514-398-7493), McIntyre Medical Bldg, Room 1137
Dr. E. Cook (514-398-7691), McIntyre Medical Bldg, Room 1225

MODULE	LECTURER	DATE	ROOM (McIntyre Bldg)
1	Drs. E. Cook / James Tsui	Sept. 3 & 4	409
		Sept. 10 & 11	409
2	Dr. E. Cook	Sept. 17	409
		Sept. 18	**1101**
		Sept. 24 & 25	409
		Oct. 1 & 2	409
3	Dr. M. Chacron	Oct. 8 & 9	409
		Oct. 15	409
		Oct. 16	**1101**
		Oct. 22 & 23	***No Class***
		Oct. 29 & 30	409
4	Dr. M. Glavinovic	Nov. 5 & 6	409
		Nov. 12	409
		Nov. 13	**1101**
		Nov. 19 & 20	409
Student Presentations		**Nov. 26 & 27**	**803**

Mark Distribution:

- Take-home assignments **50%**
- Term Paper **35%** **(due on Thursday, December 3rd, 2009)**
- Presentation **15%**

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see http://www.mcgill.ca/integrity for more information).

The Department of Physiology will not tolerate any academic offences with regard to cheating and plagiarism. For details, please see "Student Rights and responsibilities Handbook" at http://www.mcgill.ca/secretariat/handbooks/student

In accord with McGill University's Charter of Students' Rights, students have the right to submit in English or in French any written work that is to be graded (except in courses where knowledge of a language is one of the objectives of the course).

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

ANALYZING PHYSIOLOGICAL SYSTEMS: PHGY 425

Semester:	Fall
Schedule:	2 lectures each of 90 minutes per week
Pre-Requisites:	PHGY 311, BIOL 200. Students are encouraged to have taken BIOL 309
Credit Weight:	3

Abstract:

With the invention of new technologies, biological research is rapidly becoming a quantitative science. Two areas stand out: systems biology, the quantitative physiology of single cells, and computational neuroscience, connecting the brain's biological machinery to information processing. This course provides an introduction to quantitative physiology, a mode of thinking and a set of tools that allows accurate prediction of the behavior of biological systems. Examples will range from oscillating genetic networks to understanding higher brain function. Throughout, "hands on" modeling and data analysis through computer exercises will be emphasized.

Evaluation:

Each module will have a take-home assignment worth a total of 60%. In addition, each student must write a term paper (35%) and give a 10 minute presentation (15%) on a topic approved by the course coordinator. The term paper should involve a literature survey and some computational modeling.

Syllabus:

Module 1: Introduction to MATLAB Programming (Drs. E. Cook and J. Tsui)

Overview of the MATLAB programming environment. Emphasis on how to write simple data analysis programs and basic data visualization.

Module 2: Computational Models of Higher Brain Function (Dr. E. Cook)

Introduction to cortical function. Models of cortical circuitry. Signal detection theory applied to cortical neurophysiology. Artificial neural networks for memory function. Computational basis of reward and prediction signals in the brain.

Module 3: Principles of Spike Train Analysis (Dr. M. Chacron)

Statistical approaches to the analysis of neural data. Action potential patterns and their potential roles in information processing. Reverse correlation.

Module 4: Molecular Mechanisms of Information Transmission (Dr M. Glavinovic)

Mathematical modeling of synaptic transmission and calcium dynamics. Diffusion in confined space with a chemical reaction. Continuous modeling, Monte Carlo simulation and molecular dynamics.

Staff:

PHGY 425 Lecturers	Office	Phone	E-Mail
Dr. J. Tsui	MNI – 8th floor	398-1254	james.tsui@mail.mcgill.ca
Dr. E. Cook	McIntyre – Room 1225	398-7691	erik.cook@mcgill.ca
Dr. M. Chacron	McIntyre – Room 1137	398-7493	maurice.chacron@mcgill.ca
Dr. M. Glavinovic	McIntyre – Room 1204	398-6002	mladen.glavinovic@mcgill.ca

Course Secretary:

Ms. Maria Dimas	McIntyre – Room 1021	398-4315	maria.dimas@mcgill.ca