REPRESENTATIVE SYLLABUS
CONTENT OF FUTURE COURSES MAY VARY

NEUR 2001

PRINCIPLES OF NEUROSCIENCE (4 credit hours)

Instructor - [redacted]

E-mail [redacted]
Office [redacted]
Office hours - [redacted]
Class days/time/place – [redacted]
Laboratory – [redacted]

Required Textbook:
Thomas J. Carew (2000) Behavioral Neurobiology: The Cellular Organization of Natural Behavior (Sinauer Associates Inc.).

Additional sources:
Other books, reviews, and papers indicated in lecture notes and/or posted on T-square.
NOTE: Lectures may use outside sources in addition to (or instead of) the textbook.

Grading:
Exams (3 in-class exams and one final exam) – 60%
In class activity, quizzes and assignments (including, but not limited to: questions to lectures and presentations; participation in group discussion; two best quizzes out of 3-4 surprise quizzes offered in the class; homework on scientific papers in the field) – 20%.

Group lab reports – 20%

Prerequisites:
Pre-requisite or with concurrency BIOL 1510 and PSYC 1101

Goal:
This course will introduce the neuroscience of selected animal behaviors for which there is sound understanding of underlying neural mechanisms. It is designed to capture excitement over new advances in neuroscience – both conceptual and methodological, and to provide them with the background needed to understand topical subjects, such as neurodegenerative diseases and brain-computer interfaces. This course is not the typical descriptive survey of the nervous system - its development was driven by an abiding commitment to providing students with fundamental principles that they can apply to understand and further explore wide-ranging operations and behaviors in the nervous system, many of which they will explore through exercises required of them individually and in groups both within and outside the classroom.

Learning Objectives:
Upon completion of this course, students will be able to:
1. relate animal behavior to structures and functions of the nervous system.
2. recount major principles and theories in neuroscience.
3. evaluate neuroscience topics covered in class.
4. appreciate and even apply neuroscience methods.

Overview:
Selected animal behaviors are examined through neuroscience to expose not only theories and principles of nervous system operation, but also describe the conceptual reasoning and methods used in discovery.

Description:
This course is designed to transmit our most recent understanding of animal behavior through the eyes of neuroscientists. Great advances have been made toward mechanistic understanding of a variety of fascinating animal behaviors, from which we select representative cases for study. Having established in the first section of the course the building blocks of nervous system operation, we move to problem-based considerations of how the nervous system operates to produce, for example, sound localization and spatial memory, and to distinguish behaviorally relevant objects. Through these examples, students will explore the neuroscience underlying sensory, motor, and cognitive behaviors. A central premise of this course is that different parts of the nervous system and different animal species utilize similar neural mechanisms to produce behavior, meaning that one can extract fundamental principles from selected examples. In addition, the topics illustrate the multi-scale (genetics and molecules to cells and neural circuits to behavior) and interdisciplinary (e.g. biology, physiology, physics, psychology) features of neuroscience. The course will also introduce students to neuroscience technologies and methods, some of which will be examined in the laboratory associated with the course.

Information will be presented and assimilated through a variety of approaches. Classroom time will be apportioned by approximately 2/3 lecture and 1/3 faculty-facilitated discussions among students divided into groups. Weekly laboratory sessions will enable students to participate in data collection, either real or simulated and in discussions of current literature. Preparation for small group discussions and laboratories will required students to complete reading assignments outside class time.

Academic Integrity:
Georgia Tech does not tolerate dishonesty. This includes cheating, lying about course matters, plagiarism, or helping others commit a violation of the Honor Code. Some exams (when specifically announced in class) allow the use of self-prepared supporting information (one sheet of paper, either typed or handwritten, could be double-sided); no other support materials are allowed at tests. Plagiarism includes reproducing the words of others without both the use of quotation marks and citation. Students are reminded of the obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct, available online at www.honor.gatech.edu.

Excused Absences Policy
In the event of a medical emergency or an illness that is severe enough to require medical attention, students are responsible for contacting the Office of the Dean of Students as soon as possible. Additional details are available online:
http://www.catalog.gatech.edu/rules/4/

Learning Accommodations:
If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services (http://disabilityservices.gatech.edu/).

Schedule of Topics:

In class lecture and discussion 3 hours per week
Laboratory 3 hours per week

Section 1 *The Neuro Machine*

Week 1: Neurons – excitability and signaling
Lab 1A: Neural Simulation

Week 2: Synapses - inter-neuronal communication, neurotrophic support
Lab 1B: Neural Simulation

Week 3: Circuits - units of behavior, information processing, response formulation
Lab 2A: Neural Activity in Worms

Week 4: Team Based Discussion (neuromodulation)
Lab 2B: Neural Activity in Worms

Week 5: Exam 1

Section 2 *Which way do we go?*

Week 6: Flight in locusts
Lab 3A: Motor signals that drive movement

Week 7: Movement generation and control principles
Lab 3B: Motor signals that drive movement

Week 8: Group Discussion (escape behavior in crayfish)
Lab 3C: Motor signals that drive movement

Week 9: Exam 3 (covers material from weeks 9-11)

Section 3 *How do we get there?*

Week 10: Feature analysis in toads
Lab 4A: Sensors and sensation

Week 11: Sensory detection and encoding principles
Lab 4B: Sensors and sensation

Week 12: Group Discussion (prey localization in barn owls)
Lab 4C: Sensors and sensation

Week 13: Exam 2 (covers material from weeks 5-9)

Section 4 *If I could only remember…*

Week 14: Learning and memory aplysia
Lab 5A: Adapting movement in the visual world

Week 15: Principles of learning and neural plasticity
Lab 5B: Adapting movement in the visual world

Week 16: Group Discussion (spatial navigation in rats)

Finals Week Exam 4 (covers all course material)