

NSC 4356 001—Neurophysiology— Fall 2006

Green Hall 4.301 Monday & Wednesday 11:30-12:45
AM

Instructor Contact Information

Dr. Marco Atzori

GR 4.212 972-883-4311

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Office hours: Mon. 1-2 PM

Prerequisites: NSC 3361

Behavioral Neuroscience and NSC 4353 Lab Methods

Course Description: The central nervous system is a complex array of neuronal cells connected in a highly ordered anatomical and cytoarchitectonic array. Its functional properties are determined to a great extent by the membrane properties of neurons, and by the manner in which they communicate with each other. The Neurophysiology course is a survey of the biophysical properties of membrane conductances in neuronal and sensory cells, aimed to supply the basic information to understand how single neurons respond to electrical and chemical stimuli.

Student Learning Objectives:

After completing the course, students should be able to:

Course Learning Objectives

After completing the course, students should be able to:

- 1.1 Describe the historical development of neuroscience as a cross-disciplinary science.
- 1.2 Describe and analyze the contributions of anatomical, physiological, behavioral, pharmacological, developmental, and cell and molecular biological studies to the bases of neuroscience:
 - h) use proper scientific terminology for neurotransmitters, neurotransmitter receptors, and neurotransmitter receptor/effector signalling systems,
 - k) work with models describing electrical activity of neurons, particularly the role of ion channels in maintaining and altering neuronal membrane polarization
- 2.2 Describe how current methods sometimes limit our understanding of the nervous system, and drive innovation to develop new and better techniques:
 - e) describe and analyze neurophysiological recording methods used to assess neuronal activity, and limits of these techniques
- 2.3 Describe why multiple research techniques and multiple levels of analysis (systems, network, cellular, synaptic, etc.) are preferred to address basic questions in the neurosciences, rather than reliance on a single technique or level.

Required Textbook and Materials:

Bertil Hille: Ion Channels of Excitable

Membranes, Third or later edition, Sinauer, 2001

Kandel, Schwartz, Jessel: Principles of Neural Science, McGraw-Hill, 4th or later edition

Suggested: Guyton and Hall, Medical Physiology

Exams and Assignments:

Exams: Students will be evaluated with a written test 4 times along the course. Tests will consist in multiple choice questions on the preceding lessons. Specific criteria for evaluation will be indicated for each test. In general, approximately 30-50 questions with 5 possible answers will be asked. **Attendance:** Students are encouraged to take all tests to ensure a regular advancement in their learning, and to avoid unproductive last-minute tour-de-force for completing their studies. Attendance of classes is not mandatory but is strongly recommended, as tests will be based on material taken from the classes and will in no way necessarily be restricted or including the topics indicated in the syllabus, which is meant to be solely an approximate guide to the course.

Grading Policy Grading is based on a set of a priori criteria: 90% correct for A's, 80% for B's, 60% for C's, and 50% for D's. The instructor has the prerogative of changing the evaluation brackets at his discretion, even from test to test. Students who will fail or will not attend a test will have the opportunity to present the missing material at their midterm or at the final. Students who want to improve their evaluations will also be able to re-present the material at the midterm or at the final. **BRING A SCANTRON FORM 229630 FOR EVERY MUL. CHOICE TEST**

Course & Instructor Policies

DON'T MISS AN EXAM! Make-up exams will be given only if: (a) you were seriously ill and have verifiable documentation from a physician, or (b) you were detained the day and time of the exam, or (c) you made arrangements prior to the exam to attend an urgent family affair (e.g., funeral). In any of these cases, you must notify one of the professors or TAs in advance of the scheduled time of the exam (call and leave a voice-mail message if you can do nothing else). Otherwise, you will receive an F. It is the student's responsibility to make sure that an exam is made up within one week of the scheduled time. Beware, make-up exams are designed to be more comprehensive to compensate for having more study time.

Faulty Exam Questions: Occasionally, we write faulty exam questions. If you encounter such a question, let us know immediately after the exam period. (You may talk to the instructor or leave a note with the secretary in the Associate Dean's Office, GR 4.528). We will

consider your arguments before grading the exams, and if necessary throw out the question for everyone.

Calendar

August

- 24 Introduction
- 26 Ohm's law, Nernst equation (Hille, chapter I)

September

- 7 Hodgkin and Huxley model (II)
- 9 Voltage gated channels (III)
- 14 V-gated Ca^{2+} channels (IV)
- 16 Potassium channels (V)
- 21 review
- 23 test
- 28 Ionotropic lig.-gated chann. (VI)
- 30 Metabotropic channels (VII)

October

- 5 Ca^{2+} dynamics (IX)
- 7 Sensory physiology
- 12 review
- 14 midterm exam
- 20 Control of movement: cortex, basal ganglia and cerebellum (Kandel chapter 33)
- 22 Brain stem: modulation of sensation, movement and consciousness (K45)
- 27 Seizures and epilepsy (K46)
- 29 Sleep and dream (K 47-48)

November

- 2 The autonomic nervous system (K 49)
- 4 Emotional states and feelings (K 50)
- 9 review
- 11 test
- 16 Motivational and addictive states (K 51)
- 18 Disorders of thought and volition: schizophrenia (K 60)
- 23 Depression, mania and anxiety (K 61)
- 25 Learning and memory (K62-63)
- 30 Mirror neurons (notes)

December

- 2 Cholinergic modulation of transmitter release (notes)
- 7 review
- 9 test

Final exam: see academic calendar

These descriptions and timelines are subject to change at the discretion of the instructor.

Student Conduct & Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If

the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed.

An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:

The University of Texas at Dallas, SU 22

PO Box 830688

Richardson, Texas 75083-0688

(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations.

Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

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