

SYLLABUS

COURSE: NSC 4373-001 (80859) Sensory Neuroscience FALL 2016

Instructor: Aage R. Møller Ph.D.

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Office Hours by Appointment

TA: Shaurabh Nandy <shaurabh@utdallas.edu>

Class schedule: Main Campus:

Monday-Wednesday 4:00-4:45 PM

Class room: HH2.402

Start: August 22, 2016

Class cancelled:

Labor day: September 5

Fall Break: 11/21-11/23

Thanksgiving holidays: 11/24-11/26

Class text:

Møller, A.R. Sensory Systems: Anatomy and Physiology, Aage R. Møller Publishing, 2012, revised 2014.

Note: The book is uploaded on E-Learning and the instructor will provide paper copies of the book (free).

PDFs of all the slides I show in lectures and voice recordings of lectures will be available on E-Learning.

Supplementary readings:

Brodal P. The Central Nervous System 4th edition

New York, Oxford University Press, 2010 ISBN 978-0-19-538115-3

Grading:

Midterm exam: Week of October 3. Date to be announced

Final exam: Week of December 5. Date to be announced

Course purpose: The purpose of this class is to develop an understanding of the anatomy and function of sensory systems, and some of the disorders that affect sensory functions.

General objectives:

Students will:

1. Understand similarities and differences between different sensory systems
2. Understand how a physical stimulus is conducted to the sensory organs in all 5 senses
3. Know the anatomy of sensory organs and the differences between different senses.
4. Know the anatomy of ascending sensory pathways
5. Understand the difference between classical and non-classical ascending sensory pathways.
6. Know the anatomy of efferent systems and some of their functions
7. Understand the factors that are necessary for eliciting a sensation
8. Understand how sensory information can reach structures of the limbic system
9. Understand how expression of neural plasticity can affect the function of sensory systems
10. Understand the pathophysiology of some common disorders that affect the function of sensory systems

Course layout

This is a systems oriented course that covers the anatomical organization and the physiology of sensory organs, sensory receptors and the ascending and the descending sensory pathways. The course emphasizes the similarities between the different senses and describes the basic features of sensory transduction, the transformation of the physical stimuli before they reaches the sensory cells, and the coding of sensory stimuli in the discharge pattern of individual nerve fibers of the nerves that innervate the sensory receptors. The anatomy of both the classical and the non-classical ascending pathways are described in detail. The transformation that occurs in the nuclei of the classical ascending neural pathways and the processing that occurs at different levels of the central nervous system is discussed. The function of the non-classical and the anatomy and the function of the descending systems are also included. The pathophysiology of some common disorders of sensory systems and the role of neural plasticity in creating symptoms and signs of disease are discussed.

OUTLINE

1. Introduction

2. Basic psychophysics

3. Anatomy and Physiology of Sensory Organs

Anatomy of sensory organs

Sensory receptors

Innervation of sensory receptors

Conduction of the physical stimuli to the receptor cells

Physiology of sensory receptors

General principles of sensory transduction

Information processing at the receptor level

Selectivity of receptors

Amplitude compression

Receptive fields

4. Anatomy and Physiology of the Sensory Nervous System

Anatomy of sensory nervous systems

Ascending and descending systems

The thalamus is the gateway to the cortex

Classical and non-classical ascending pathways

The thalamus is the gateway to the cortex

Cortical projections

Information processing in the sensory nervous system

Extracting useful information (feature detection)

Coding in the classical pathways

Processing of object and spatial properties of sensory stimuli

Control of flow of information

Reciprocal innervation adjust processing

Importance of arousal

Processing of information in non-classical pathways

How is the neural code of sensory information interpreted?

Sensory information can reach non-sensory parts of the CNS

Motor systems

Autonomic system

Emotional reactions to sensory input

Processing of information in the sensory nervous system is dynamic

Neural plasticity

Symptoms and signs of disease from neural plasticity

5. Somatosensory system

Anatomy and physiology of the somatosensory system

Classical ascending system

Non-classical ascending system

Pain

6. Hearing

The ear

Anatomy and physiology

Auditory and physiology of the auditory nervous system

Classical ascending system

Non-classical ascending system

Descending systems

Neural plasticity

7. Vision

The eye

Anatomy and Physiology

Anatomy and physiology of the visual nervous system

Classical ascending system

Non-classical ascending system

Descending systems

8. Chemical senses

Anatomy and physiology of receptors

Anatomy and physiology of the olfactory and gustatory nervous system

9. Pathophysiology

Deficits

Sense organs

Hyperactivity

Central nervous system

The role of neural plasticity

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.

7/10/14