

Integrative Neuroscience Syllabus – Fall 2024

Course: NSC 4354.001 - Integrative Neuroscience

Professor: Dr. Puja Parekh

Term: Spring 2025

Meetings: Tuesday & Thursday 8:30am – 9:45am in CR 1.212

Professor's Contact Information

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Office Hour: Online Thursday 10:00 – 11:00am (Office Hours channel in the course Team)

General Course Information

Pre-requisites: NSC 3361 Introduction to Neuroscience

Course Description: Integrative Neuroscience examines the collective behavior of neuronal systems with respect to motor control, sensory processing, and regulation of more advanced behavioral, motivational, and cognitive functions.

Learning Outcomes

- Describe and analyze the contributions of anatomical, physiological, behavioral, pharmacological, developmental, and cell and molecular biological studies to the bases of neuroscience, and: a) describe the principles of (1) feedback, (2) reciprocal connectivity, and (3) distributed processing fundamental to self-organizing neural systems, b) describe neural mechanisms of (1) motor control, (2) sensory processing, (3) homeostatic maintenance, and (4) higher cognitive functions (including learning, memory and emotions), c) describe the anatomical and functional organization of the autonomic nervous system and neuroendocrine systems.
- Identify and explain why research questions rather than methods ideally drive advances in neuroscience, and: a) describe and analyze common behavioral methods used to interpret neuronal function in current studies, and limits of these techniques, b) describe and analyze use of different lesions (natural, accidental and induced) in nervous systems to infer function, & limits of these techniques, c) describe and analyze non-invasive imaging techniques used to assess nervous system structure and function, and the temporal and spatial limits of these techniques compared to other available methodology.
- Describe why multiple research techniques & multiple levels of analysis (systems, network, cellular, synaptic, etc.) are preferred to address basic questions in the neurosciences, not reliance on a single technique or level.
- Students will be able to make reasoned arguments about major issues of a scientific nature.

A course in the neurosciences takes aim at a constantly moving target. This course covers three core areas of neuroscience: (1) cellular properties of different types of neurons that suit them to (and/or limit) the specific tasks they carry out; (2) organization of functional neural systems that determine the behavioral and cognitive properties of living organisms; (3) critical evaluation of the research methods used to assess (1) and (2). The aim is to familiarize you with systems analyses of brain function, which must take into account all known neurobiological and psychological data. Since no current framework fully meets these comprehensive goals, you will be trained to critically evaluate current and future theories that purport to do so. Class discussion is strongly encouraged.

Suggested Texts & Materials: D. Purves et al., (eds) *Neuroscience* 6th edition (2017) ISBN-10: 1605353809.2 (or 7th edition).

Assignments & Academic Calendar

Date	Topic/Lecture	Reading	Assessment/Activity	Due Date
January 21	Introduction			
January 23	Sensory systems: Touch and Proprioception	Ch. 9		
January 28	Sensory systems: Pain	Ch. 10		
January 30	Sensory systems: Visual system	Ch. 11	Quiz 1: touch, pain, vision	11:59PM 1/31/25
February 4	Sensory systems: Central visual pathways	Ch. 12		
February 6	Sensory systems: Auditory system	Ch. 13	Quiz 2: central visual pathways	11:59PM 2/7/25
February 11	Sensory systems: Vestibular system	Ch. 14		
February 13	Sensory systems: Chemical senses	Ch. 15	Quiz 3: auditory, vestibular	11:59PM 2/14/25
February 18	Review session: Sensory systems		Quiz 4: chemical senses	11:59PM 2/19/25
February 20	Exam 1: Sensory systems		TESTING CENTER 2/20 – 2/21	
February 25	Motor systems: Spinal cord and motor units	Ch. 16		
February 27	Motor systems: Upper motor neurons and brainstem	Ch. 17	Quiz 5: spinal cord	11:59PM 2/28/25
March 4	Motor systems: Basal ganglia	Ch. 18		
March 6	Motor systems: Cerebellum	Ch. 19	Quiz 6: brainstem & basal ganglia	11:59PM 3/7/25
March 11	Motor systems: Visceral motor system	Ch. 21		
March 13	Changing brain: experience-dependent plasticity	Ch. 25	Quiz 7: cerebellum and visceral	11:59PM 3/14/25
March 18	Spring break – no class			
March 20	Spring break – no class			
March 25	Changing brain: repair and regeneration	Ch. 26	Quiz 8: plasticity	11:59PM 3/26/25
March 27	Review session: Motor systems and changing brain			
April 1	Exam 2: Motor systems and changing brain		TESTING CENTER 4/1 – 4/2	
April 3	Complex brain functions: Cognitive functions	Ch. 27		
April 8	Complex brain functions: Cortical states and sleep	Ch. 28	Quiz 9: cognitive functions, sleep	11:59PM 4/9/25
April 10	Complex brain functions: Attention	Ch. 29		
April 15	Complex brain functions: Learning and memory	Ch. 30	Quiz 10: attention, learning, memory	11:59PM 4/16/25
April 17	Complex brain functions: Emotion	Ch. 31		
April 22	Complex brain functions: Speech and language	Ch. 33	Quiz 11: emotion, speech, language	11:59PM 4/23/25
April 24	Review session: Complex brain functions			
April 29	Exam 3: Complex brain functions		TESTING CENTER 4/29 – 4/30	
May 1	Review session: Sensory, motor, changing brain, complex functions			
May 13	Exam 4 (OPTIONAL): Sensory, motor, changing brain & complex brain functions		TESTING CENTER 5/13 – 5/14	

Course Policies

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved Access Ability Resource Center accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Attendance

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes.

Class Participation

Regular class participation is expected. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Access Ability Resource Center has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Access Ability Resource Center accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#). The instructor may record meetings of this course. These recordings will be made available to all students registered for this class if the intent is to supplement the classroom experience. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law.

Grading (credit) Criteria

- Quizzes: 25% of your grade
 - There will be 11 quizzes & the lowest quiz grade will be dropped
- Exams: 75% of your grade
 - There will be 4 exams & the lowest exam grade will be dropped (Exam 4 is optional)

Grading Scale

The plus/minus grading system is used in this course. A+ (97–100), A (94<97), A- (90<94), B+ (87<90), B (84<87), B- (80<84), C+ (77<80), C (74<77), C- (70<74), D+ (67<70), D (64<67), D- (60<64), F (<60).

Quizzes and Exams are taken online using eLearning. Exams will be administered at the Testing Center. Students must register and follow these guidelines: <https://ets.utdallas.edu/testing-center/students/>

Make-up Exams

Excused absences for exams require both appropriate documentation and advance notice by email. Excused absences will be given only if: (a) you are seriously ill and have verifiable documentation from a physician, or (b) you were detained by law at the exam time, or (c) you made prior arrangements to attend a verified religious or family event or represent UTD in a university- sanctioned event. In ALL these cases except (b), you must notify the instructor in advance by email; for (b), your court order will suffice. Otherwise, you will receive a zero (0) for that evaluation. A maximum extension of one week (7 days) beyond the scheduled due date can be granted for excused absences only.

Extra Credit Any extra credit opportunities will take place in class. No additional extra credit opportunities will be available.

Late Work Late submission of assignments requires both appropriate documentation and advance notice by email. A maximum extension of one week (7 days) beyond the scheduled due date can be granted if approved.

Classroom Citizenship

- You are expected to do your own work. Cheating, plagiarism, collaboration/collusion, and any other form of academic dishonesty will not be tolerated and will result in referral to the Office of Community Standards and Conduct.⁴
- Meaningful and constructive dialogue is encouraged in this class and requires a willingness to listen, tolerance for different points of view, and mutual respect from all participants. All course members will be expected to show respect for individual differences and viewpoints at all times.
- Any discussion from class that continues online should adhere to these same rules and expectations. The use of electronic devices can be disruptive to those around you. As a result, the use of such devices should be limited to class-related tasks.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same: "As a Comet, I pledge honesty, integrity, and service in all that I do."

Accommodations for Students with Disabilities

Please review [the](#) section within the UT Dallas Syllabus Policies and Procedures webpage.

Academic Support Resources

Please visit the Academic Support Resources page to view the University's academic support resources for all students.

UT Dallas Syllabus Policies and Procedures

Please visit the Syllabus Policies page to view the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.