



Molecular Neuroscience
NSC 4362.001

Instructor Information

Instructor: Dr. William (Will) Marks

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Office location: JO3.106

Office phone: 972-883-2432 (Note, this phone does not receive text messages)

Class Time & Location: GR4.428, Tuesdays & Thursdays, 8:30 – 9:15 AM

Office Hours: Monday 11-12, Wednesday, 2:30-3:30, Thursday, 1-2:30

Course Information

Pre-requisites NSC 4352, CHEM 1311, CHEM 1312, Biol 2311

Course Description:

Neuroscience is a remarkable interdisciplinary field requiring analysis at many levels; behavioral, electrophysiological, and molecular. This course is designed to educate students on the principles of molecular biology to better understand the biology of the brain.

This course focuses on the basic cellular and molecular mechanisms that control neuronal functioning, with an emphasis on the regulation of gene expression via genetic, epigenetic, and molecular signaling mechanisms. Relevant examples will reference regulating cellular excitability, LTP, learning and memory, and psychiatric and neurological diseases. The concept and application of modern molecular neuroscience techniques will also be discussed.

Course Learning Objectives:

After completing the course, students should be able to:

- Describe how information is stored in DNA
- Demonstrate an understanding of activity-dependent transcriptional and translational mechanisms in the brain
- Describe the functions of protein degradation pathways in the brain
- Describe how genetic mutations affect gene and nervous system function
- Recognize epigenetic mechanisms in brain functions
- Explain the various techniques used to modulate the genome in neuroscience research
- Use critical thinking to analyze and critique the literature

Course Materials:

The Primary Reading materials in this course will be primary literature and review papers. These papers will be posted on eLearning. Additional recommended readings may be suggested from the following sources:

Recommended textbook:

Molecular Biology; by David P. Clark, Nanette J. Pozdernik, and Michelle R. McGehee; Academic Cell, 3rd Edition, 2018; ISBN-10: 0128132884 ISBN-13: 9780128132883.

Assignments & Academic Calendar

Date	Topic/Lecture	Assessment/Activity
1/21	Introduction	
1/23	DNA, RNA, Genes, and Proteins	
1/26	Transcription	
1/28	Transcriptional regulation of neuronal function	
2/2	Translation & protein modification	
2/4	Translational regulation of neuronal function	
2/9	Exam 1 review	
2/11		Exam 1
2/16	Protein Degradation Pathways Pt. I	
2/18	Protein Degradation Pathways Pt. II	
2/23	Genetic Mutations: Impacts on gene and Nervous system Function Pt. I	
2/25	Genetic Mutations: Impacts on gene and Nervous system Function Pt. II	
3/2	Exam 2 Review	
3/4		Exam 2
3/9	Epigenetics Pt. I	
3/11	Epigenetics Pt. II	
3/16	No Class	Spring Break
3/18	No Class	Spring Break
3/23	Molecular manipulation of gene expression: plasmids, viral vectors	
3/25	Molecular manipulation of gene expression: RNA interference, Cre-Lox technology	
3/30	Molecular manipulation of neural circuits: CRISPR/Cas9 genome editing Pt. I	
4/1	Molecular manipulation of neural circuits: CRISPR/Cas9 genome editing Pt. II	
4/6	Exam 3 Review	
4/8		Exam 3
4/13	PCR, RNA Seq, and Fluorescent In-Situ Hybridization (FISH)	
4/15	Neuron track tracing: Rabies virus and Cholera toxin B	
4/20	Precision targeting of neural circuits: Optogenetics, DREADDs Pt. I	
4/22	Precision targeting of neural circuits: Optogenetics, DREADDs, Pt. II	
4/27	Gene and cell therapy, ASOs	
4/29	Exam 4 Review	
5/6		Exam 4
5/8	Final exam Review	
Final Exam date: TBD		Comprehensive final exam

Course Policies

<p>Class Materials</p>	<p>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 Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.</p>
<p>Class Attendance</p>	<p>Regular and punctual class attendance is expected. While attendance is not strictly mandatory for this class, it is highly recommended. This is by its nature an information dense course, and missing lectures will not set you up for success.</p> <p>If at any point in the semester class attendance drops below 50%, the instructor reserves the right to implement a mandatory attendance policy for the remainder of the semester.</p>
<p>Class Participation</p>	<p>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.</p>
<p>Class Recordings</p>	<p>Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording or photographing any part of this course. Recordings or materials provided by the instructor may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.</p> <p>The instructor will 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. Bear in mind, these recordings are intended as a supplement, and not a replacement for coming to class and interacting, as this is an in person class, not an online or hybrid class. <u>If at any time, course attendance drops below 50%, the instructor may terminate recordings for the remainder of the semester.</u></p> <p>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.</p>
<p>Grading (credit) Criteria</p>	<ul style="list-style-type: none"> • Research Summaries 20% of your grade Throughout the semester, you will be responsible for attending and summarizing 7 different professional research talks given at UTD or UT Southwestern Medical Center. You will summarize the talk with a special focus on the technical approaches applied in the design of the presenter's research. A detailed rubric will be provided. • Participation: 10% of your grade [or 0%] This course will have regular participation events in class. While attendance is not strictly mandatory, missing class will impact your ability to participate in group discussions. • Exams: 70% of your grade [or 80%] There will be 4 regular exams and one optional cumulative exam. The cumulative exam, if taken, can be used to replace the lowest regular exam score.

	<p>Alternate grade calculations: Whichever of the following percent combinations results in the highest final score will be used to calculate the final grade:</p> <ul style="list-style-type: none"> -Option A: 20% Research Summaries, 10% participation, 70% exams -Option B: 20% Research Summaries, 0% participation, 80% exams <p>The plus/minus grading system is used in this course. Letter grades will be assigned according to the following cutoffs:</p> <p>A+ (97 - 100) A (94 - 96) A- (90 – 93) B+ (87 – 89) B (84 – 86) B- (80 – 83) C+ (77 – 79) C (74 – 76) C- (70 – 73) D+ (67 – 69) D (64 – 66) D- (60 – 63) F (< 60).</p> <p>The numbers represented by the grading scale are not flexible. Anything less than the minimum cutoff for a grade category will be considered in the category below (Example: a score of 89.95 will result in a B+. A score of 90.00 will result in an A-). Rounding or “grade bumps” will not be considered under any circumstances. Requests for rounding or “grade bumps” will be declined without consideration.</p>
Make-up Exams	<p>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. If it is not possible to notify in advance, notification must be made as soon as possible. <u>It is the students responsibility to inform me of any issues.</u> 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.</p> <p>Make up exams WILL NOT be the same as the exam administered in class, and may be administered in a different format (for example, short answer, essay or oral exam) as determined by the instructor.</p>
Extra Credit	<p>Extra credit <u>may</u> (note the choice of word “may”, and not “will”) be given only at the instructor’s discretion to the entire class. No individual requests for extra credit will be granted. Requests for extra credit for the whole class make such an event more unlikely.</p>
Late Work	<p>Late work will not be accepted and will be graded as a Zero. If an issue comes up that prevents you from completing an assignment, it is the students responsibility to notify according to the policy below.</p> <p>Makeups for missed assignments require appropriate documentation, advance notice by email, and confirmation by the instructor. Appropriate reasons are laid out in the “Make-up exams” section. Criterion will be more strict for approval, as quizzes and assignments are not single day events (waiting until the last minute is never a good strategy). A maximum extension of one week (7 days) beyond the scheduled due date can be granted, but length is contingent on assessment by the instructor on a case by case basis. Makeups for missed assignments will only be given/graded if completed before the exam for which the assignment was preparing you. (for example, a quiz on material for exam one cannot be completed after exam one has been administered).</p>

Classroom Citizenship	<ul style="list-style-type: none"> 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. 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.
Communication	This course utilizes both in-person and online tools for interaction and communication. Grades will be posted as soon as they are available. Student emails will be answered within 3 working days under normal circumstances. In event of classroom emergencies, (such as lecture cancellations for a DFW Snowpocalypse), I will send an email to all enrolled in the class.
eLearning	The course syllabus, class lecture slides and other resources will be posted on eLearning, which can be accessed using your UT Dallas NetID account on the eLearning website. Please see the course access and navigation section of the Getting Started with eLearning webpage for more information. No portion of these materials may be sold, retransmitted, reposted, duplicated or otherwise used without the express written approval of the author.
Technical support	UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The eLearning Support Center includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.
Comet Creed	<p><i>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:</i></p> <p><i>“As a Comet, I pledge honesty, integrity, and service in all that I do.”</i></p>
Academic Support Resources	<p><i>The information contained in the following link lists the University’s academic support resources for all students.</i></p> <p><i>Please go to http://go.utdallas.edu/academic-support-resources.</i></p>
Academic Integrity:	Academic Dishonesty including but not limited to cheating on exams and sharing or posting exam questions (with or without the correct answers) will not be condoned in my class or at UTD. Any action deemed as potential academic dishonesty will be reported to the Office of Community Standards and Conduct for official review.
UT Dallas Policies and Procedures	<p><i>The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus. Please review the sections regarding the credit/no credit grading option and withdrawal from class.</i></p> <p><i>Please go to http://go.utdallas.edu/syllabus-policies for these policies.</i></p>

Individual help is also available. You are welcome and indeed encouraged to meet with me or our TAs during office hours or by appointment to go over difficult concepts, discuss learning strategies, and review exams. You must help us to help you. **Note:** the day before the test is too late for that exam...the week before finals is too late for the course...Plan ahead!

If you require any accommodations or have concerns, please let Dr. Marks know as soon as possible so that appropriate arrangements can be made.