NSC 4363—Neuropharmacology—Covid Spring 2022

CRA 12.110 Tues-Thurs 1:00–2:15 PM (Instructional mode TBD)

Professor:	**Dr. Tres Thompson**	tres@utdallas.edu	http://www.utdallas.edu/bbs/agingmemorylab
		BSB 14.102/JO3.104	Office hours: Tues 11:30 – 12:30
		972-883-4933	call via Teams for now
Grad. TA:	**Rey West**	Reyanne.West@utdallas.edu	Office hours: Thursdays, 2:30-3:30.
Undergrad TAs:	**Janah Jaber**	Janah.Jaber@utdallas.edu	Review sessions (Teams): TBD
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Prerequisite: NSC 4352 or NSC 4354

Course Description: The neurobiology of CNS and peripheral neurotransmission. A survey of neurotransmitter functions with emphasis on effects in the central nervous system. Covers receptor theory, neurochemistry, neurotransmitter metabolism and release. Relationships between neurotransmitter activity and behavioral and pathological states are discussed where appropriate. Includes ionotropic and metabotropic coupling of neurotransmitter receptors to both their cellular and systemic effects. Clinical efficacy, side effects, and other issues related to drug use and abuse are covered.

The course introduces and discusses in depth three major areas of neuropharmacology: (1) the bioavailability of compounds that we class as drugs (i.e. those compounds with receptor mediated actions); (2) the cellular mechanisms that produce drug actions in the nervous system and its targets; (3) specific drug effects (and side-effects), divided topically by receptor type. Agonist, antagonist, and mixed effects will be discussed and analyzed from the molecular to the behavioral level, stressing both experimental and clinical uses.

Student Learning Objectives: After completing the course, students should be better able to:

1.1 Describe and analyze major concepts, theoretical perspectives, empirical findings, and historical trends in neuroscience.

1.3 Integrate pathological findings from psychology, psychiatry, physiology, or neurology with basic scientific work in the neurosciences.

1.4 Use proper scientific terminology for neurotransmitters, neurotransmitter receptors, and neurotransmitter receptor/effector signalling systems.

1.5 Assess interactions of specific ligands (drugs) with specific neurotransmitter systems.

1.6 Distinguish between ionotropically and metabotropically-mediated pharmacological effects.

3.3 2.4 Describe how current methods sometimes limit our understanding of the nervous system, and drive innovation to develop new and better techniques.

3.4 Identify appropriate applications of neuroscientific knowledge in the health, service, education, or business professions.

4.3 Demonstrate how neuroscience can contribute to understanding behavioral and social issues and aid public policy.

NOTE: ***I don't own copyright to the graphics used in lectures, so I can't post my slides online. NOTE: memory research clearly demonstrates that humans remember information better if they actively engage multiple brain systems, i.e. write it down themselves, and rewrite it soon thereafter in more detail, rather than passively read, view or listen to it (i.e. this actively recruits multiple systems involved in learning & memory to interact), so take good notes in class.*** *Analog methods (paper & pencil) have persisted for millennia for good reason.* ***Taking/posting PHOTOS or diagrams from my lecture slides online is prohibited, and constitutes an academic offense.***

Textbook:

Molecular Neuropharmacology (Nestler et al.), 3rd ed., McGraw-Hill.

An excellent supplemental text is *Cellular & Molecular Neurophysiology* (Hammond), 4th Ed., Elsevier.

The text serves as background material for class lectures and discussion, but new material is always presented in lectures. Neuropharmacology is a rapidly advancing field, and as neuroscience students you must strive to keep up with the current state of the field.

Exams: There are 3 comprehensive exams plus a comprehensive final. Unique material for these exams will be taken from class lectures and discussion, so **regular timely attendance is very strongly advised**. The format of the exam questions is challenging and encourages integrative thought about the material; i.e. it rewards an understanding of pharmacology, not rote memorization. Multiple question formats will be used, so be prepared for such (75 points per exam, for a total of 300 points for the semester). **NO extra credit assignments are allowed nor should they be requested**; attendance at TA reviews is considered, however, particularly for those whose attendance is requested.

Grading Policy: Grading is based on exam performance, using *a priori* criteria: 90% correct for A's, 77% for B's, 65% for C's, and 50% for D's, with total number of points summed across the course. Plus/minus grades will be determined by point distributions within your class. Again, please do not ask for special favoritism/extra credit on grading.

Course Policies:

• Class begins promptly. Being late/leaving early or failing to attend class regularly penalizes only one person: **you**. Prior experience indicates that lecture attendance significantly correlates with grades.

• Excused absences for exams are given **ONLY** if: (a) you are seriously ill and have verifiable documentation from a physician, or (b) you were legally detained at the exam time or (c) you made prior arrangements to attend a verifiable religious or family event. Except (b), you **must notify the instructor > 4 hr IN ADVANCE of the exam by e-mail**. Failing to do so, you will receive a zero (0) for that exam. A single makeup exam will be scheduled w/in 5 days of the original exam date, except for the final exam, which must be taken on or by the final exam date.

• Grades and exams are via eLearning, and discussed in a timely manner to give you feedback for future study. All exam materials are the property of the instructor; copying them IN ANY FORM is an academic offense potentially punishable by expulsion.

• When in class in person, **YOUR phone must be OFF**, and you should **refrain from web surfing** or other disruptive behavior. Watch videos/text/game/chat on your own time, not in class. It disturbs the attention of others here to learn.

Class schedule

(subject to change at the discretion of the instructor, or the whims of Texas politicians, health care professionals, or the weather).

Date	Topic	Read Chapters
Jan. 18	Introduction to neuropharmacology	-
20	Pharmacokinetics & pharmacodynamics	1
25	Presynaptic events & neurotransmitter release	3
27	Receptors & receptor binding	2
Feb 1	Signal transduction: G-proteins	4
3	Signal transduction: 2nd messengers I	4
8	Signal transduction: 2nd messengers II	4
10	**Exam I:** Basic mechanisms in neuropharmacology	via eLearning
15	Voltage-gated ion channels I: Na^+, Cl^-, others	2
17	Voltage-gated ion channels II: Ca2+	2
22	Voltage-gated ion channels III: K^+	2
24	Glutamate receptors I: AMPA/KA-Rs	5
Mar. 1	Glutamate receptors II: NMDA-Rs (NRs)	5
3	Inhibitory amino acids I: Glycine-Rs, $GABA_A$-Rs, $GABA_C$-Rs	5
8	Cholinergic receptors I: Nicotinic-Rs	6
10	**Exam II:** Ion channels and ionotropic receptors	via eLearning
15, 17	**SPRING BREAK**	No classes
22	Inhibitory amino acids II: $GABA_B$-Rs	5
24	Glutamate receptors III: mGluRs	5
29	Cholinergic receptors II: muscarinic-Rs	6
31	Biogenic amines I: catecholamines I: dopamine	6
Apr. 5	Biogenic amines II: catecholamines II: NE, EPI	6
7	Biogenic amines III: indolamines (serotonin)	6
12	Biogenic amines IV: histamine & orexin	6
14	**Exam III:** Metabotropic neurotransmitters	via eLearning
19	Steroids & peptide hormones	7,9
21	Anesthetics & alcohol	8
26	Opiates & anti-inflammatories	7,8
28	Cannabinoids	-
May 3	Drug regulation: Science vs. politics	8
5	**Exam IV**: Comprehensive	via eLearning

NOTE: The Chapters (NOT page numbers) listed above should be read BEFORE each class meeting.

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus:

Please go to http://go.utdallas.edu/syllabus-policies for these policies.