BCS/NSC/PSY 246: Biological Basis of Mental Disorders

Tuesday & Thursday 9:40AM-10:55 AM

Room: Goergen 101

Spring 2026

INSTRUCTOR

Renee Miller, Ph.D. (renee_miller@urmc.rochester.edu)
Office: Meliora 303F
Office Hours: Thursday 11:15-12:45 or by appointment

Undergraduate TAs Meghana Kakaraparthi and Vanita Shih

Exam Review Sessions (1-2 days before each in-class exam): TBD

Please note that emails containing questions or concerns about course material will be answered as promptly as possible, however, do not expect to receive a reply if you ask a question within 24 hours of an exam as this may not always be possible.

Course Intent: The objective of this course is to present current understanding of biologic mechanisms involved in the etiology and pathology of various brain disorders, including both those disorders generally classified as "mental disorders" and disorders generally classified as "neurologic disorders." Basic concepts of neurobiology will be presented along with discussion of the clinical presentation and management of the various disorders. The material to be presented is broad. In addition to the required book, we will select readings from a variety of other sources.

Course Structure: The first five lectures introduce the student to general neurobiological systems whose dysfunction is thought to mediate diseases and general principles of how treatments are developed to mitigate this dysfunction. The remainder of the course is devoted to describing the clinical phenomenology of a wide range of disorders and current evidence regarding underlying neurobiological mechanisms and specific approaches to treatment of them one at a time.

Book (required):
Linden, David. 2018. The Biology of Psychological Disorders. 2nd Edition. Palgrave-McMillan Press. The text is on reserve at Carlson Library.

Online: https://urldefense.proofpoint.com/v2/url?u=https-3A__ebookcentral.proquest.com_lib_rochester_detail.action-3FdocID-3D4762971&d=DwICaQ&c=4sF48jRmVAe_CH-k9mXYXEGfSnM3bY53YSKuLUQRxhA&r=aImieQF8xcXxuqE6tBFGM2E5iQSBoL-nIH7wR-

v4cAI&m=RAC_TTr9j09_Gwk4rj7KPmbN3NgVM3fQJf3Vn6-xC_8&s=3clUSguFznBuu-O5_n95kAOVyfJpA7RR8aTM7CgT3Xg&e=

Other (will be made available):

All other readings will be placed on electronic reserve on Blackboard. These readings are REQUIRED unless otherwise noted. In particular I have assigned Nature Reviews: Disease Primers as a complement to your textbook for each disease covered in the class. In my experience, the most successful students routinely do the reading prior to the lecture. The reading is meant to provide a broad overview of each topic, while lecture material highlights and expands that baseline. Thus, if you come to lecture without the basic reading done, you may feel confused and find it harder to catch up. **Put another way, the lectures will not simply be a recap of the readings.**

Course Evaluation: One at-home problem set, two exams, and one short paper account for 100% of the final grade. The breakdown will be 25% for each assessment. The at-home problem set will be posted after class on Feb 4 and is due by the 1:00pm on Feb. 6. Any exam received after the due date will be assessed a 5-point penalty for each 24-hour period that it is late.

The second and third exams will be taken in class, on blackboard. An exam may be re-scheduled only in the event of documented illness, personal or family emergency, other extraordinary circumstances, or a conflict with religious or scheduled University commitment that prevents the student from being able to complete the exam in the allotted window. Schedule conflicts must be discussed with the instructor **at least one week prior** to the scheduled exam. Course letter grades will be assigned based on the average of the scores of the problem set, the two in-class exams and the final paper.

The final average is rounded up to the nearest whole number. Grades represent a threshold of performance which is either exceeded, or it is not. Cut-offs for letter grades and sub-levels are as follows: A ≥ 90, A- 88-89, B+ 87, B 80-86, B- 78-79, C+ 77, C 70-76…

Upward adjustment (from one grade sub-level to the next - B+ to A-, B to B+, etc.) may be made **at the discretion of the instructor** for students who participate actively and constructively in class and/or office hours and/or show evidence of steady improvement over the semester (i.e., improvement from one full letter grade to another).

Extra credit: Attendance with documentation at four hours of university-provided in-person yoga or meditation classes will result in a four-point bonus on your final average. Please submit your documentation to BB all at once, not as you go. This evidence consists of selfies taken in class and confirmation screenshots for classes attended.

Academic Honesty
It is my intent that you do your own work in this class. I will challenge you to develop problem solving skills in the context of understanding disease mechanisms and

diagnoses—the only way to do so is to practice. We will be particularly sensitive to instances of shared work on the at home problem set. To avoid the consequences spelled out by the University (https://www.rochester.edu/college/honesty/), please be sure to do your own work. These regulations apply to work, including exams, done online as well. In most cases, you will run out of time (or be locked out of the exam) if you are trying to look up answers to exam questions, but the policy remains that you may not use outside resources on in-class exams.
If you use an AI like ChatGPT for the purpose of "cleaning up" or "professionalizing" your written work, I require that you hand in the before and after versions of the assignment. There will be no penalty for using ChatGPT or similar for this purpose as long as it is declared but this is the only allowable use of the technology. The unsanctioned use of such technologies or failure to cite them will be considered a violation of the policy for this course.

Schedule of Lectures and Readings:

My recommendation with respect to these readings is to skim them before class. Your textbook is pretty easy to read, while the early book chapters and some later scientific articles (review and primary research) can be quite dense. If you skim the material first, you can take cues from my lecture as to what is most important and focus on that. The exception is the journal club meetings: these papers must be read carefully before class so that you're ready to present in class.

Date	Topic	Readings (On reserve or from your textbook)
Jan 20	Introduction	1) Defining Mental Illness (Eric Maisel) 2) Book of Woe-DSM-V (Gary Greenberg)
Jan 22	Neurotransmitters	1) Linden Chapter 2 2) Deutch and Roth: Neurochemicals
Jan 27	Receptors and Transduction	1) Girault, J-A. and Greengard, P. Principles of Signal Transduction, (C & N, Ch. 4) pp. 41-65 (optional) 2) Linden Chapter 9
Jan 29	Neuroplasticity	1) Nestler, E.J. and Hyman, S.E. Mechanisms of Neural Plasticity (C & N, Ch. 5) pp. 66-75; 2) McGill, B.E. and Zoghbi, H.Y. (2009) Epigenetics of Psychiatric Diseases, (C & N, Ch. 8 - focus on pp. 104-110 and 118-121).
Feb 3	Hormonal Influences on Brain Function	1) Linden Chapter 1 2) Linden Chapter 3 3) Linden Chapter 7 **AT-HOME EXAM 1 Available on BB 11:00AM**
Feb 4		**AT-HOME EXAM 1 DUE by 10:00PM**
Feb 5	Huntington Disease 1	1) Huntington disease. Nature Reviews: Disease Primers

Feb 10	Huntington Disease 2	1) Original articles in BB **recommended reading** 2) Linden Chapter 6
Feb 12	HD 3- **Journal Club**	1) Li et. al. Metabotropic Glutamate Receptor 2/3 activation improves motor performance and reduces pathology in H mice. 2021 J. Pharmacol Exp Ther.
Feb 17	Alzheimer disease 1 (recorded)	1) Mayeux, R. Early Alzheimer's Disease NEJM 2010 2) Linden Chapter 22 3) Alzheimer disease. Nature Reviews: Disease Primers
Feb 19	Alzheimer disease 2 (recorded)	1) Recent advances in animal models of AD
Feb 24	Parkinson Disease 1	1) Linden Chapter 22 2) Parkinson disease, Nature Reviews: Disease Primers
Feb 26	Parkinson Disease 2	1) Liu et al, a7-nicotinic AChR-mediated neuroprotection against DA neuron loss, J Neuroinflamm. 2012 2) PD Review-oxidative stress and more 3) Crabtree & Zhang, Genetically engineered mouse models of Parkinson's disease, Brain Res. Bull. 2012
Mar 3	PD 3 - **Journal Club**	1) Sampson et al. Gut Microbiota Regulate Motor Deficits and Neuroinflammation in a model of Parkinson's Disease. 2016 2) Smith et al. A neuroscience perspective of the gut theory of PD. 2018
Mar 5	**EXAM 2**	
Mar 10		Spring Break
Mar 12		Spring Break
Mar 17	Addiction 1	1) Linden Chapter 17 Charney and Nestler, Chapter 45
Mar 19	Addiction 2	1) Bogdan et al, The Genetically informed model of addiction 2021 Nature Reviews 2) Koob, et. al. Hedonistic model of addiction. Science 1997
Mar 24	Mood Disorders-Depression 1	1) Major Depressive Disorder, Nature Reviews: Disease Primers 2) Nrn depression N&V on *dusp-1* 3) Chapter 27 Animal Models of Mood Disorders 4) Linden Chapter 13
Mar 26	Mood Disorders-Depression 2	1) Belleau et al, The impact of stress and Major depressive disorder on Hippocampal and mPFC morphology. 2018 2) Anaker and Hen. Neurogenesis and Cognitive flexibility: effect on mood, NRN 2017

		3) Castren and Monteggia. BDNF signaling in depression and anti-depressant action. 2021
Mar 30	**Journal Club**	1) MAPK inhibitor in depression (DUSP-1)
Apr 2	Anxiety 1	1) Linden, Chapters 14 & 15* 2) Anxiety Disorders Nature Reviews: Disease Primers
Apr 7	Anxiety 2	1) Ressler & Mayberg, Targeting abnormal neural circuits in mood and anxiety disorders. Nat Neurosci. 2007 2) Animals and Anxiety Review
Apr 9	Schizophrenia 1	1) Schizophrenia, Nature Reviews: Disease Primer 2). Bencherif et al. Alpha7 nicotinic cholinergic neuromodulation may reconcile multiple neurotransmitter hypotheses of schizophrenia. Med. Hypotheses 2012. 1) 3) Linden Chapter 16 & 24, relevant sections
Apr 14	Schizophrenia 2	1) Gulchina et al. 2017. Epigenetic mechanisms underlying NMDAR hypofunction…in schizophrenia. J. Neuroche 2) Belforte et al. Postnatal NMDA receptor ablation in corticolimbic interneurons confers schizophrenia-like phenotypes. Nat. Neurosci 2010 3) Schizophrenia pruning N&V OPTIONAL: C4 complement in schizophrenia
Apr 16	Epilepsy	1) Scharfman, Helen. The Neurobiology of Epilepsy. Curr Neurol Neurosci Rep. July 2007. 2) Epilepsy, Nature Reviews: Disease Primers 3) Jahveri et al. Stress and Epilepsy. 2023
Apr 21	**Journal Club**	Tan et al. Neuregulin 1 represses limbic epileptogenesis through ErbB4 in parvalbumin-expressing interneurons. Nat Neurosci. 2012.
Apr 23	Autism Spectrum Disorders	1) Nisar and Harris, Neuroimaging genetics approaches to identify new biomarkers for the early diagnosis of ASD. 2023 2) Willsey et al, Genomics, convergent neuroscience and progress in understanding ASD. 2022
Apr 28	**EXAM 3**	
Apr 30	Glia	1) Han et al. Forebrain engraftment of human glia cells. 2013 2) Tsai et al. High Fat Diet induces depression-like phenotype via astrocytes. 2022 3) Yao et al. HFD induces depression & HPC neurogenesis defects with microglia activation. 2022
	Glia papers Due May 6 1:00pm	