

USC School of Pharmacy

Pharmacy Undergraduate Programs

Spring 2022: GSEM 141g: Diseases of the Brain: Why Haven't we won the Battle Yet?
Satisfies GE D: Life Sciences

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Course Weight:

4 Units

Day/Time/Location:

Tuesday/Thursday, 3:30 PM to 4:50 PM in **Waite Phillips Hall WPH B-30** (NEW classroom)

Introduction

The human brain remains as one of the most challenging topics in science. It is much more than a complex computer designed to store information and utilizes comprehensive and complex neural “wiring” (connectome) to solve problems. These connections can quickly respond to the environment and experience, displaying what is termed neuroplasticity, the ability to alter the strength of connections, create new circuits, all leading to the emergence of new behaviors and the maintenance of established ones. It is only within the last few years that we are beginning to expand our understanding and appreciation of the dynamic human brain. Unfortunately, the human brain is subject to a wide spectrum of neurological disorders and diseases at all stages of life from birth, development, adolescence, adult hood, and old age. These manifest in complex behaviors and are often incompatible with sustainable life. The economic and social burden of neurological disorders is vast and continues to grow. As such, there is a great need to better understand brain disorders and to find new pharmacological and non-pharmacological treatments to address these issues.

The purpose of this freshmen seminar course is to provide an opportunity for students to explore a spectrum of brain disorders, spanning a wide range of topics including neurodevelopmental disorders such as schizophrenia and autism; neurodegenerative diseases such as Alzheimer’s and Parkinson’s diseases; neurological conditions linked to alcohol and substance use disorders, and much more. Another goal of this course is to introduce and help the entering students to better

understand current and future therapies ranging from pharmaceutical and nutraceutical options to treatments such as brain stimulation and lifestyle changes.

The themes of this course include (1) discussions that introduce the student to the brain, functions of the brain – how the brain works in a simplified manner; (2) discussions around neurodegenerative diseases such as Alzheimer’s and Parkinson’s disease; (3) neuropsychological disorders such as Schizophrenia; (4) spectrum disorders such as attention deficit hyperactivity disorder (ADHD); (5) diseases linked to or brought on by alcohol and substance use disorders; (6) drug discovery: why are diseases of the brain so difficult to treat.

Overall, the class will draw upon a range of critical and analytical approaches to these topics and will conclude with an exploration of the links between the shortcomings of the current treatment strategies and how can we do this better. This will include presentations that will discuss strategies in processes used to discover, develop, and get FDA approval to be used in humans. This will include oral medicines, nasal sprays, IV injections and other novel formulations that are being incorporated in the drug strategy to help advance the delivery of drugs to the brain. These themes will be presented in ways that are designed to lead to lively discussions during class.

Student Learning Outcomes

By the end of this course, students should be able to:

- Describe, in plain language, many of the common functions and processes of the brain and how these processes are affected by brain diseases.
- Explain why diseases of the brain are detrimental to life processes and why it is important for society to focus on those.
- Describe some of the societal and economic burden of these diseases.
- Explain the current strategies used to discover and develop therapies for brain disorders.
- Compare and contrast therapies that are currently available for brain disorders and describe why they are falling short in treating these diseases. Explain shortcomings of strategies.
- Adapt scientific information about these diseases into plain language for general consumption.
- Describe and apply theories shared in the media as they pertain to diseases of the brain.

Grading and Evaluation

Evaluation based on a midterm and final examination, quizzes on course readings, and two research and reflection papers that will form the basis for student-led discussions in class and participation.

Attendance at all classes is expected.

10% Quizzes

There will be 4 quizzes over the course of the semester to count towards their grade. Each quiz will be worth 2.5%. The quizzes will be based on questions from the lecture and from the readings and will include multiple choice, T/F and fill-in the blank questions.

20% Midterm

There will be 1 midterm for this course that will cover the first 8 weeks of course material. The midterm will consist of a series of questions involving T/F, Multiple Choice and short answers.

25% Reaction Papers: 25% awarded for reaction papers to class topics. Beginning in Week 2 and continuing to Week 15 students will be required to prepare two (2) reaction reports. These reports will be related to the weekly topics and students will sign-up for their topics via blackboard. Students will prepare a one page reaction paper. Students will need to research their topic based on materials presented and outside reading that will be suggested during the lectures and updated on Blackboard. This can include journal articles, news report, legal case, ethical issue, or policy review. Students should then be prepared to lead class discussion on the topic that week. Students are encouraged to sign-up early as it is first come, first served – once a topic week has passed, no additional reactions will be accepted for that week. You are expected to cite at least two sources (class books and articles, articles from journals, books, etc.) per essay. You will be penalized -5 points for each missing resource. The reference page does not count toward the total paper length. You should **NOT** use Wikipedia or any other similar form of wiki to write these essays. The reaction papers cannot be on the same topic as the analytical paper.

20% Final Exam

The Final Exam will be in the form of an in-class examination during exam week. The final exam will be composed of two parts, each having equal weight towards the final grade. The first part of the exam will include questions from the lectures and from the textbook in the form of multiple choice, T/F and fill-in the blank questions. The second part of the final examination will consist of short written answers to demonstrate the students' knowledge regarding topics covered in the course. This latter part of the final exam will allow students to express their ideas based on facts derived from the course.

20% Analytic Paper

Students will write a 3–4-page analytic paper on the framing of an issue as presented in scientific reports, pharmaceutical blogs, news media and any other sources pertinent to any one of the disease states presented in class. Notably, you cannot select a topic that you have presented as one of your reaction papers. We want this to be a new area of study for you. The goal of the paper is to present a paper discussing the challenges of a particular disease and/or therapies related to the disease as well as future opportunities to treat the disease. The student will draw on the framework provided in class.

5% Participation

Participation will include asking and answering questions and being actively involved in the discussion. It is expected that the students complete the assigned readings prior to the lecture and be prepared to discuss background, current understanding, treatments, and gaps in knowledge for the topic in each lecture.

V. Grading

a. Breakdown of Grade

Assignment	% of Grade
Quizzes 20 pts	10%
Reaction Papers 2@ 25 pts each	25%
Midterm Exam 40 pts	20%
Final Exam 40 pts	20%
Analytic Paper 40 pts	20%
Participation 10 pts	5%
TOTAL 200 pts	100%

b. Grading Scale

93% to 100%: A	79% to 81%: B-	65% to 67%: D+
90% to 92%: A-	76% to 78%: C+	62% to 64%: D
87% to 89%: B+	71% to 75%: C	55% to 61%: D-
82% to 86%: B	68% to 70%: C-	0% to 54%: F

Course Readings

Required Readings

How the Brain Works: The Facts Visually Explained, March 2020

Publisher: DK; ISBN-10: 1465489797; ISBN-13: 978-146548979

The text is mandatory because 1) It only costs \$14 on Amazon and 2) it is a great primer that visually illustrates the complexity and disease states of the brain that we will be covering. Students do not need to have a background in neuroscience as they will be able to use identified chapters in the text to support their learning process throughout the semester.

Other course materials including but not limited to the syllabus, supplemental reading assignments and additional handouts will be posted on <http://blackboard.usc.edu/>. The students will also be encouraged to use the online discussions among students via Blackboard.

Supplemental Readings

“Aging Wisely: Brain Health for Everyone.” This short series of videos (only about 15 mins total for all five videos, collectively) are recommended to enhance the students understanding of the process of ageing and will provide suggested ways to help your brain age more successfully. Many of the topics presented over the course of the semester will be linked to changes in brain health.

<https://www.youtube.com/watch?v=67Gp7HTBLEA>

<https://www.youtube.com/watch?v=3fybKItIsRI>

<https://www.youtube.com/watch?v=OSehGuSDGc0>

<https://www.youtube.com/watch?v=tuveGb3G1g0>

<https://www.youtube.com/watch?v=EZ3vBAG917w>

Chapters from the core textbook will be supplemented with a variety of source materials including online resources, media outlets and cinema. Supplemental materials will be available on blackboard either as documents, media links, or embedded files. The selected materials are intended to provide students with a broader perspective by rounding out the information presented in the required text.

Content Warning

Our course readings and classroom discussions will often focus on mature, difficult, and potentially challenging topics. As with any course dealing with drug use, abuse and addiction, course topics can at times be political and personal. Readings and discussions might trigger strong feelings—anger, discomfort, anxiety, confusion, excitement, humor, and even boredom.

Some of us will have emotional responses to the readings; some of us will have emotional responses to our peers’ understanding of the readings; all of us should feel responsible for creating a space that is both intellectually rigorous and respectful. Above all, be respectful (even when you strongly disagree) and be mindful of the ways that our identities position us in the classroom.

Course Outline

This course will be in the format of a directed seminar/lecture under the guidance of the instructor for the specific session. During each weekly session the instructor will engage the students with questions and draw comments or interpretations primarily based on the assigned reading. Students are expected to ask questions and participate in an interactive fashion.

Week & Date	Topic	Subtopics to be Included	Assigned and Supplemental Reading
Introduction and Background			
Week 1 Jan 11, 13	Dr. Davies Introduction: expectations and goals of this class. General overview of the physical brain.	What the brain does How does it change during development? From a simplistic standpoint, what are the key players in the brain.	DK “Physical Brain” pp 10-48 neuroanatomy made simple https://www.youtube.com/watch?v=gGeZaEABacE
Week 2 Jan.18, 20	Dr. Davies Brain Functions and the Senses	How does aging affect the brain? Can we slow the process down? https://www.youtube.com/watch?v=67Gp7HTBLEA use this one min introductory YouTube and follow the next four short videos for basic terminology of aging of the brain presented above in “Recommended reading”. Genetics and the brain -- What are key differences between male and female brains and why does this matter? Nature versus Nurture – why are they important?	DK “Physical Brain” pp 50-60
Week 3 Jan.25, 27	Dr. Asatryan Human Senses in a complex world. Quiz 1 Jan 25th	How do we “Sense” the world around us? What are our key senses and why are they important? How do we “move” what are the mechanics of movement linked to the brain.	DK “Brain functions and the Senses” pp 64-102
Communication; Memory, Learning and Thinking.			
Week 4 Feb. 1, 3	Dr. Church Communication Consciousness and the Self	General Principles Language – How do we learn a language What is consciousness? Importance of sleep	DK “Communication” pp 106-130; 162-178
Week 5 Feb 8, 10	Dr. Church Memory, Learning and Thinking	What is memory Recalling a memory Why we forget Creativity	DK “memory learning and thinking” pp 134-158 Learning and Memory https://www.youtube.com/watch?v=R0wbTR95VEs
Neurodegenerative Diseases and Current Therapies			
Week 6. Feb.15, 17	Dr. Jakowec Diseases of aging Quiz 2 Feb 15th	Alzheimer’s Disease most common neurodegenerative disease A disease of old age?	DK p 200
Week 7 Feb. 22, 24	Dr. Jakowec Diseases of aging	Parkinson’s Disease second most common neurodegenerative disease A disease of old age?	DK p 201
Week 8 March 1, 3	Dr. Jakowec Diseases of aging	Huntington’s Disease – an example of a orphan neurodegenerative disease. What is an “orphan” disease and why does that matter?	DK p 201
Midterm March 8th			
Spectrum Disorders			
Week 9 March 10	Dr. Phan Autism Spectrum Disorder Tourette’s Syndrome	What is Autism? What makes a disease a “Spectrum Disorder”? What is Tourette’s Syndrome?	DK p 217 DK p 209

MARCH 13, 2022 – MARCH 20, 2022: SPRING RECESS, no class 3/15 or 3/17

Week 10 March 22, 24	Dr. Phan Attention Deficit Hyperactivity Disorder (ADHD)	What is ADHD and why is this learning disorder important to understand? Why do amphetamines help patients with ADHD? Why do amphetamines NOT help learning and memory in college students not afflicted by ADHD?	DK p 216
Week 11 March 29, 31	Dr. Phan Anxiety Disorders Quiz 3 March 29th	Anxiety: what are the effects on learning, sleep, general well-being? .	DK p 208
Week 12 April 5, 7	Dr. Asatryan Alcohol Use Disorders	AUD: Pharmacology and physiology of alcohol use disorders? Clinical development of novel therapeutics for AUD	DK p 212
Week 13 April 12, 14	Dr. Church Substance Use Disorders Quiz 4 April 14th	SUD: what are key brain regions driving SUD? Anxiety/AUD/SUD and Covid what they have in common	DK p 212
Week 14 April 22 NO Class Wellness Day.			
Pharmaceutical Development of CNS drugs			
Week 14 April 19, 21	Dr. Gukasyan Pharmaceutical Development of CNS drugs	What are the challenges of developing novel drugs for CNS? Introducing the Blood-brain barrier.	Examples drawn from case studies
Week 15 April 26, 28	Dr. Gukasyan Pharmaceutical Development of CNS drugs	Development Strategies and Considerations for Combination Products. Comprehend different drug delivery systems Scale-up /formulation challenges	Examples drawn from case studies
Final Exam: Tuesday May 10, 2022 from 2:00 to 4:00 PM			

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
osas.usc.edu

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu

chan.usc.edu/otfp

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.