

USC Mann

Alfred E. Mann School of Pharmacy
and Pharmaceutical Sciences

Spring 2023: GSEM 141g: Diseases of the Brain: Why Haven't we won the Battle Yet?

Satisfies GE D: Life Sciences

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Instructors

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Course Coordinator

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Course Weight:

4 Units

Day/Time/Location:

Tuesday/Thursday, 2:00 PM to 3:20 PM in KAP 134

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

10% Assignments (Quizzes)

The Assignments are meant to be a learning tool for you. Over the course of the semester there will be 2 Assignments. Completion of the Assignments should result in full credit as long as you put in a good faith effort. Each quiz will be worth 5 % (10% total). 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.

30% Reaction Papers: Beginning in Week 2 and continuing to Week 15 students will be required to prepare three (3) reaction reports (10% per report). 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.

Due Date: Reaction Paper 1: Thur. Feb 2 at 11:59 PM

Due Date: Reaction Paper 2: Tues. Feb 28 at 11:59 PM

Due Date: Reaction Paper 3: Thurs. Apr 6 at 11:59 PM

25% 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.

15% 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.

Due Date: Thurs. Apr 20 at 11:59 PM

V. Grading

a. Breakdown of Grade

Assignment	% of Grade
Assignments (Quizzes) 2 @ 5% each	10%
Reaction Papers 3 @ 10% each	30%
Midterm Exam	20%

Assignment	% of Grade
Final Exam	25%
Analytic Paper	15%
TOTAL	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.

“Aging Wisely: Brain Health for Everyone.” This short series of videos (only about 15 mins total for all five videos, collectively) are required viewing 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>

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

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

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 & Supplemental Reading
Introduction to the Course and Background				
Week 1		Dr. Davies		
Tues. Jan 10		Introduction: expectations and goals of this class.	What the brain does	DK “Physical Brain” pp 10-48
Thur. Jan 12		General overview of the physical brain	How does it change during development? From a simplistic standpoint, what are the key players in the brain. 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” section.	neuroanatomy made simple https://www.youtube.com/watch?v=gGeZaEABacE
<i>Martin Luther King Day: University Holiday, Monday, January 16, 2023</i>				

Week 2 Tues. Jan 17 Thur. Jan 19	Dr. Jakowec Brain Anatomy Brain Functions	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 Assignment 1 due Jan 24th Tues. Jan 24 Thur. Jan 26	Dr. Jakowec or Asatryan Brain Functions, continued	How do we “move” what are the mechanics of movement linked to the brain. How do we “Sense” the world around us? How do we see, hear, smell, taste, sense touch and feel pain? Language – How do we learn a language? What is consciousness? What is memory - recalling a memory, why we forget. Importance of sleep. Creativity, intelligence.	DK “Brain functions and the Senses” pp 64-102; “Communication” pp 106-130; 162-178 DK “memory learning and thinking” pp 134-158 Learning and Memory https://www.youtube.com/watch?v=R0wbTR95VEs
Neurodegenerative Diseases and Current Therapies			
Week 4 Tues. Jan 31 Thur. Feb 2	Dr. Jakowec Neurodegenerative diseases	Most common neurodegenerative diseases Alzheimer’s Disease, the most common neurodegenerative disease	DK p 200
Week 5 Tues. Feb 7 Thur. Feb 9	Dr. Jakowec Neurodegenerative diseases	Parkinson’s Disease second most common neurodegenerative disease. Treatment options	DK p 201
Week 6 Tues. Feb 14 Thur. Feb 16	Dr. Jakowec Orphan neurodegenerative disease	What is an “orphan” disease and why does that matter? Huntington’s Disease – an example of an orphan neurodegenerative disease.	DK p 201
President’s Day: University Holiday, Monday, February 20, 2023			
Week 7 Tues. Feb 21 Thur. Feb 23	Dr. Jakowec 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
Midterm Exam: Feb 28th			
Spectrum Disorders			

Week 8 Thur. Mar 2	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?	DK p 216 DK p 209
Week 9 Tues. Mar 7 Thur. Mar 9	Dr. Phan Anxiety Disorders	Anxiety: what are the effects on learning sleep, general well-being?	DK p 208
Spring Recess: No Class on Tuesday, March 14 or Thursday, March 16			
Neuroinflammatory & Substance Use Disorders			
Week 10 Tues. Mar 21 Thurs. Mar 23	Dr. Asatryan Neuroinfectious Disease Traumatic Events	CNS bacterial and viral infections. Meningitis, encephalitis, etc Stroke, consequences, recovery	DK p XXX Reading materials will be provided
Week 11 Tues. Mar 28 Thurs. Mar 30	Dr. Asatryan CNS demyelinating disorders Substance Use Disorders	Multiple sclerosis, major CNS autoimmune demyelinating disease Drug, addiction, substance use disorders.	DK p XXX Reading materials will be provided
Week 12 Tues. Apr 4 Thurs. Apr 6	Dr. Asatryan Substance Use Disorders	Neurobiology of drugs - reward pathway Alcohol use disorder – pharmacology, physiology	DK p XXX Reading materials will be provided
Week 13 Tues. Apr 11 Thurs. Apr 13	Dr. Asatryan Substance Use Disorders Dr. Vera-Schubert	Alcohol use disorder - behavioral effects Opioid crisis, fentanyl, overdose, harm reduction	DK p XXX Reading materials will be provided
Pharmaceutical Development of CNS Drugs			
Week 14 Tues. Apr 18 Thurs. Apr 20	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 Tues. Apr 25 Thurs. Apr 27	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: Thursday, May 4, 2023, 2 to 4 PM in KAP 134			

Academic Integrity:

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

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

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

[*988 Suicide and Crisis Lifeline*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[*Relationship and Sexual Violence Prevention Services \(RSVP\)*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)*](#) - (213) 740-5086

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

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 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) 740-0411

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

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

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) 442-1200 – 24/7 on call

Non-emergency assistance or information.

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

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) 442-2850 or otfp@med.usc.edu

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