

Neuroscience of Aging and Disease

INSTRUCTOR INFO

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Office hours are a dedicated time set aside just for students, when I'm available to talk about anything you'd like. This might include questions about course material or exams, discussions about the class more broadly, or conversations about getting involved in research and exploring neuroscience or psychology graduate programs. Whether you come with specific questions or more open-ended questions, office hours are a welcoming space to chat.

If you cannot attend my office hours, but would still like to meet with me, please email me to set up a time that works for both of us.

COURSE DESCRIPTION

Aging is a universal process that shapes our bodies and brains, influencing molecular and cellular function to neural systems and behavior. However, across these different systems, there is inherent variability. Age-related decline in cognitive function and behavior has been well-documented, and yet there are some individuals who are "super-agers" and maintain exceptional memory and cognitive function, performing like individuals who are decades younger. At the same time, aging increases the vulnerability to specific neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. What are the neural mechanisms that may underlie these large differences in cognitive outcomes? This course will go through the biological, neurological and cognitive changes associated with nonpathological aging and neurodegenerative disorders such as Alzheimer's disease and Parkinson's disease.

This course is designed for students who may be interested in aging and dementia and who may be applying for medical school or graduate school. We will also consider current approaches to prevention, diagnosis, and current treatments of these neurodegenerative disorders.

To accomplish this goal, we will cover basic concepts in the study of aging and neurogenerative disorders. Hands-on class activities will be utilized to understand the complexity of disease presentation and diagnosis including learning how to administer neuropsychological evaluations and reviewing case studies with complex clinical symptoms, MRIs, neuroimaging and biofluid biomarkers.

LEARNING OBJECTIVES

The goal of this course is for students to be able to **understand and explain the neural mechanisms underlying cognitive changes in aging and neurodegenerative diseases.**

COURSE FORMAT

This course will be conducted as predominately an in-person lecture-based course. Some class days will be focused on (1) patient cases, where small student groups will diagnosis a patient based on complex multifactorial symptoms, (2) hands-on learning activities where students will learn how to administer neuropsychological evaluations to assess cognitive functions such as memory, attention and executive function, and (3) class presentation days where students will present a research paper on an assigned paper at the end of the semester.

To prepare for this class, you will need to do the pre-class readings to gain an introduction to the topic.

COURSE MATERIALS AND RESOURCES

This class is based upon the primary scientific literature. All readings will be posted and made on Canvas. Other materials, such as supplemental reading, forms, and all assignments, will be made available on Canvas.

Please bring whatever you need (e.g., laptop, tablet, etc.) to access to the articles. In addition, we may also use these devices during our learning activities.

ASSESSMENT OF YOUR LEARNING

Your learning will be assessed by performance on the patient case studies, exams, and class presentations. Each of these elements will be describe in further detail below.

Assessment Type	Number of Assessments	Graded out of	Percentage of Final Grade
Pre-class assignments	5	100	5%
Class Presentation	1	100	15%
Patient Case Studies	2	100	20%
Exams	3	100	60%

Pre-class Assignments: To ensure that everyone comes to class ready to participate, the articles will need to be read prior to the beginning of class. Students should submit a short summary (300 words) on Canvas over the pre-class assignment. The pre-class reading will be scored by the thoughtfulness of your engagement with the pre-class assignment and will be due at the time of class. Please see the rubric for grading of pre-class assignments. The lowest pre-class assignment will be dropped at the end of the semester.

Class presentations: Class presentations are an opportunity for students to deepen their understanding of course material by actively engaging with ideas and sharing them with others. Over

the course of the semester, students will work together in small groups to develop and present a class presentation on a neurodegenerative disorder and a current clinical trial. Please see the rubric on the grading of pre-class assignments.

Patient Case Studies: Neurodegenerative disorders are complex and often do not follow the clean theoretical descriptions that are presented in textbooks. Over the course of the semester, students will be presented with patient histories, symptoms and clinical outcomes. As with real-life patients, sometimes there is missing information. In class, students will work together in small groups to work through clinical symptoms, review MRIs and biomarker data (if present) to diagnosis a patient and write up a brief (<250 word summary) on each patient case, the clinical diagnosis and the reason for diagnosis. No notes or outside materials will be allowed during the patient case study. Patient case studies are due at the end of class. Please see the rubric for additional grading. For students that miss the in-class patient case studies, an alternative case study assignment will be completed during office hours independently.

Exams: This is a comprehensive course that builds on prior material. To assess student's understanding of key concepts, there will be three exams administered to test students understanding of the basic concepts. Exams will be multiple choice.

Late policy: Items that are submitted 24 hours late are subjected to a -10 point deduction per day for pre-class assignments. It is the student's responsibility to reach out within 48 hours about late assignments to schedule alternative assignment. Students who miss exams and patient case studies will be docked -15 points, unless alternative arrangements were made *before* the class date or there is an institutional excused absence.

COURSE POLICIES

Grading

This course is graded on a straight scale – you are not competing against anyone else for your grade. The letter grades will be assigned by the points earned in this course through the various assessments and activities. The most stringent letter grade scale that will be used is listed below: A: ≥ 90.00% average
B: 80.00 % – 89.99% average
C: 70.00 % – 79.99% average
D: 60.00% - 69.99% average
F: ≤ 59.99%

I highly recommend that you keep track your own scores. The grade estimates in Canvas are often inaccurate.

Grade Changes: Grades are not negotiable. However, mistakes can and do occur. If you feel an assignment or quiz has been incorrectly scored, notify your instructor by email as soon as possible. Any requests for adjustment of grades must be submitted in writing no less than 48 hours after the work has been returned. In all cases, the entire assignment will be re-evaluated and a final, revised grade (higher or lower) will be assigned, if warranted.

Extensions, Late-Work and Make-ups:

Pre-class assignments will not be given an extension unless there is prior communication with the instructor. Students who miss an in-person case study or an exam will be given a 0, unless it is an excused absence approved through the institute.

If you have a religious holiday that does not align well with the official Institute calendar or an excused absence, and you will not be class, please let me know within the first two (2) weeks of the course. You may formally request an Institute Absence here: <https://registrar.gatech.edu/info/institute-approved-absence-form-for-students>

Academic Integrity: Georgia Tech seeks to cultivate a community based on trust, academic integrity, and honor. This Honor Code helps maintain an optimal learning environment that foster academic and scholastic integrity. These include respecting the intellectual property of others, submitting your own individual work unless otherwise allowed by an instructor, and protecting your own academic work from misuse by others. All students are assumed to have read the GT Academic Honor Code and consented to be bound by it.

This Academic Honor Code prevents any students from gaining an unfair advantage through academic misconduct. For this class, specific examples of academic misconduct and dishonesty include:

- Plagiarism: the unattributed use of words and/or ideas of another person. Examples include, but are not limited to: words written by another person (including yourself for a previous class) or lifted from the internet with and without proper citation; ideas taken from another person without proper citation
- Unauthorized collaboration: working with someone else on graded work (e.g., assignments, quizzes, or presentations) without explicit permission from the instructor
- Use of unauthorized aids (including, but not limited to, online 'homework' help sites) during quizzes

In short, produce your own work unless you are told otherwise. You are more than welcome to use your notes and work with others for pretty much every aspect of the course; you just need to make sure that the writing and presentations you submit are ultimately your own.

Student-Faculty Expectations: Rule XXI of the Georgia Tech Catalog defines shared mutual expectations between students and faculty to support a professional, respectful and effective learning environment. Expectations include clear communication, mutual respect, and accountability as the foundation of the academic engagement. Students are expected to attend and prepare for class regularly, engage and uphold academic integrity and minimize absences. Students should expect that faculty members provide a respectful and engaging academic environment, with clear objects and evaluation criteria, as well as grades based on course criteria.

Learning Accommodations: I have designed this course with principles of Universal Design for Learning in mind to try to make this course accessible for all; however, I recognize that some of you may have learning needs that require adaption for your success. If this is the case, please contact the [Office of Disability Services](#) on campus. I am happy to arrange to accommodate your learning needs based on their recommendations.

COURSE SCHEDULE

The course calendar details what you can expect during each scheduled class session, the due dates for all of your assignments, and other important dates for the course.

Date	Topic	Assignment Due
1/13	Introduction and Syllabus review	
1/15	Aging Demographics and Societal Impact	
	Unit 1: Psychology and Mechanisms of Aging	
1/20	Long-term decline in cognitive function	Tucker and Stern. (2011)
1/22	Neural Plasticity and Cognitive Reserve	
1/27	Background on neural systems and neuroscience	
1/29	Introduction to neuroimaging methods	
2/03	Cellular and molecular mechanisms on brain aging	
2/05	Animal and nonhuman primate models on healthy aging	Mitchell et al. (2015)
2/10	Neuroimaging Studies on healthy aging and super agers	
2/12	Exam 1: Concepts in aging	
	Unit 2: Alzheimer's disease	
2/17	Introduction to Alzheimer's disease	Lane et al. (2017)
2/19	<i>Hands-on Activity:</i> Clinical neuropsychological testing & practice	Zucchella et al. (2018)
2/24	<i>Hands-on Activity:</i> Clinical neuropsychological testing & practice	
2/26	Mechanisms in sleep and Alzheimer's disease	
2/03	Genetic and risk factors of AD	
3/05	Functional and structural neuroimaging Alzheimer's disease	
3/10	PET imaging in Alzheimer's disease	
3/12	Clinical Biomarkers in Alzheimer's disease	Jia et al. (2024)
3/17	Case Review Day 1	
3/19	Exam 2 on Alzheimer's disease	
	NO CLASS SPRING Break	
	Unit 3: Parkinson's disease and dementia with Lewy Bodies	
3/31	Introduction to Parkinson's disease and LBD	Samii et al. 2004
4/02	Biomarkers in Parkinson's disease	
	Unit 4: Other dementias	
4/07	Introduction to vascular dementia	
4/09	Introduction to Frontal Temporal Dementia	
4/14	Prion disease and other dementias	
4/16	Case Review Day 2	
4/21	Class Presentation Day 1 on therapeutic approaches, lifestyles and clinical trials	
4/23	Class Presentation Day 2: Therapeutic approaches, lifestyle and clinical trials	
4/28	In-class review session for finals	
	Final Exam	

Changes: Course content may vary from this syllabus to meet the needs of this class. Students will be notified in class by the instructor when adjustments to this syllabus are required.

ON ACADEMIC SUPPORT

- There are many options for extra help
 - Office hours for your course instructors
 - [Peer Led Undergraduate Study \(PLUS\)](#)
 - [Office of Minority Educational Development](#)
 - [Learning Assistance Program](#) in First Year Learning Centers located in the residence halls
 - [1-to-1 tutoring](#) through the Center for Academic Success supports more upper division courses
- The [CommLab](#) can help with writing lab reports or presentations
- The Center for Academic Success offers [on-demand workshops](#) for time management, test prep, etc
- [Academic Coaching](#) to work with you individually to discuss goals AND formulate strategies to reach them to improve academic skills, motivation, and confidence.

ON PERSONAL SUPPORT

- The [Center for Career Discovery and Development](#) (C2D2) can help you explore potential careers, craft resumes & cover letters and prepare for interviews
- The [pre-graduate and pre-professional](#) advising group in C2D2 that can help you learn about applying for grad or med school
- The [Office of Disability Services](#) can help you arrange accommodations for a learning disability or a service animal
- The [Center for Assessment, Referral, and Education](#) CARE is your primary resource for mental health support, and they can refer you to appropriate resources which can include:
 - [Health Initiatives](#) for issues regarding self-care, stress management, thriving, and resilience
 - The [Counseling Center](#) for a variety of services, including group, couples, and individual counselling, workshops, psychoeducational screens, and crisis intervention
 - [Stamps Psychiatry Clinic](#) for psychiatric evaluations and medication management
- The [Stamps Health Services](#) provides primary care, pharmacy, women's health, immunization, and allergy shots.
- The [Students' Temporary Assistance and Resources \(STAR\)](#) can assist with food, housing, interview clothing needs, and even interest-free emergency loans.
- There are a variety of resource centers for minority students on campus
 - [OMED](#) for underrepresented racial and ethnic groups on campus

- [Women's Resource Center](#) for women on campus
 - [LGBTQIA Resource Center](#) for LGBTQIA students on campus
 - [Veterans Resource Center](#) for veterans, military, reservist, guard members, and dependents on campus
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- The [Dean of Students Office](#) can connect you with specific resources if you are still unsure of where to go for help. The request assistance form is helpful for sharing documentation from Stamps with your professors among other things.

