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Conceptual Foundations of Cognitive Neuroscience
NEUR 411-DL1: Fall 2022

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Instructor: Dr. Worth (Trey) Boone **TA**: Fatima Asad
Instructor Email: wboone3@gmu.edu **TA Email:** fasad@gmu.edu
Course Format: Online, synchronous meeting
Credits: 3
Instructor Office Hours: Drop-in office hours are held virtually during the times below. If you are unable to attend a drop-in time, please email me to schedule an appointment.
- **Thursday 9am-10am.** Drop into the Zoom room to meet. https://gmu.zoom.us/j/3427835435

TA Office Hours (questions/feedback on Reading Response grades): TBA

Weekly Meeting: Wednesday 3:00-4:15pm,
Zoom link: https://gmu.zoom.us/j/94352176354?pwd=YSs1REpQa2pRKzg3M0R5eXhZWm9lZz09

Course Overview

This course focuses on the conceptual foundations of neuroscience, with particular emphasis on methodology and experimental inference in cognitive neuroscience. The course is designed to provide the skills and opportunity to think critically about scientific methodology, experimental design, and inferences from empirical data. We will cover lesion studies in neuropsychology, functional localization within the brain, various aspects fMRI experimental design, and generalization from the use of model organisms. The material from each of these modules will then be applied to recent research articles that employ these methods. You will be challenged to engage critically with this research through writing assignments and oral presentations. The capstone project for the course requires you to use these skills of critical analysis to generate your own research design in the form of a grant proposal.

This course fulfills the Writing Intensive (WI) requirement for the Neuroscience major. Writing intensive courses are required to assign a minimum of 3500 words, provide constructive feedback on drafts and allow revision of at least one graded assignment. The assignments in this course meet and exceed these requirements through one 750-word Article Review, 2500-word Grant assignment, and 7x200-word Reading Responses. Constructive feedback will be given on assignments. You will be able to revise portions of the Grant assignment based on peer and instructor feedback before the final assignment is due.

Course Format/Delivery

This course is fully **online with hybrid format synchronous/asynchronous format**. You will be required to log into one weekly synchronous course meeting and complete additional asynchronous work. Asynchronous work will be posted to the course Blackboard site. This work includes video lectures, course readings, and writing assignments. Each week, I will post a recorded lecture on Monday, and you must watch that lecture and read the material for that week prior to the synchronous session on Wednesday. You are expected to come to the synchronous session prepared to discuss the material for that week, and your preparedness and participation in the synchronous meetings will constitute part of you grade for the course.

This course is divided into weekly lessons. Each lesson will include activities, readings, and assignments. The first major segment of course material will cover a variety of methodological issues in cognitive neuroscience. For each of these lessons, you will be required to produce a short reading response (seven total over the semester). The second segment will then turn to critically examining both seminal and recent research articles that exemplify the methods discussed in the first segment. You will be required to produce a video presentation of an article from this session and one written research article review, the latter of which is due at the end of the semester. The capstone assignment for the

course has you generate a grant proposal. The grant project will be broken down into multiple components you will work on throughout the semester. Keep in mind that although the course has an online format, assignments still have firm due dates (see schedule).

Blackboard Login Instructions
To access the course blackboard site, log in to mymason.gmu.edu and select the Courses tab. Under the course list, select the current semester (Fall) and click the course number for NEUR-411-DL1.

Textbook
No textbook is required. Course readings will be made available through Blackboard.

Technology Requirements
Technology information for all Mason Online Course can be found here (https://masononline.gmu.edu/what-technologies-do-i-need/).

Hardware
- Windows or Macintosh computer with a fast reliable internet connection
- Recommended screen size of 13in or larger for viewing course material
- Computer speakers or headset to listen to video lectures
- Computer microphone or headset to use with Zoom for office hours and class discussion
- A webcam (built in or external) for recording presentations using Zoom
- Enough storage space to download required software and save course materials

Software
- Web browser (see Blackboard Support for supported browsers). Your browser must be up to date and running the most recent version on Java.
- Zoom for attending weekly discussion sessions and recording Article Presentations.
- Adobe Acrobat Reader to view pdf files (free Acrobat download)
- Microsoft Word and Powerpoint (Microsoft 365 Apps for enterprise available free to students here)

Office Hours
Getting help is easy. Live office hours will be held each week using Zoom. To access office hours, log into Zoom using your Mason account (instructions here https://its.gmu.edu/knowledge-base/how-to-sign-in-to-the-zoom-desktop-application/). Use the Zoom link below to access my Zoom room., You will be placed in the waiting room. If students wish to meet privately, I will see them in the order they enter. Once you are in the waiting room, please be patient as I may be finishing with another student. If the session has not been started, check the Blackboard Announcements to see if office hours have been cancelled or rescheduled that week.
- **Thursday 9am-10am.** Drop into the Zoom room to meet. https://gmu.zoom.us/j/3427835435
- If you are unable to make it to scheduled drop-in office hours, email me to set up an appointment.

Learning Goals
By the end of this course, you will be able to:
- Interpret and analyze primary scientific literature.
- Think critically about science and question scientific findings.
- Clearly present, explain, and facilitate discussions about scientific data to your peers.
- Understand key historical developments in neuroscience in understanding nervous system function.

- Identify the structure of inferences in central experimental designs in cognitive neuroscience.
- Understand limitations in the conclusions that can be drawn from particular methods and experimental designs in neuroscience.
- Communicate scientific data for a variety of audiences through oral presentation.
- Evaluate and provide constructive feedback on someone else's writing.
- Generate a unique idea for an experiment, develop that idea through systematic research, and ultimately pull it together into a grant proposal.
- Effectively respond to reviewer feedback and make changes in writing.

Grading and Assessments
There are no exams in this course. You will be assessed throughout the course based on a combination of participation, peer review and evaluation, oral presentation, and a variety of writing assignments.

Reading Responses (x7, best 6 count)	20 %
Participation (synchronous discussion sessions)	10 %
Article Review	15 %
Research Paper Presentation	15 %
Grant Project	40 %
Total Grade	**100 %**

Grading Scale:
A+	97-100%	B+	87-89.9%	C+	77-79.9%	D	60-69.9%	F	0-59.9%
A	93-96.9%	B	83-86.9%	C	73-76.9%				
A-	90-92.9%	B-	80-82.9%	C-	70-72.9%				

Assignment Details:

Reading Responses- Over the semester, you will write a total of seven 200-300 word reading responses. These responses should (a) summarize at least one key point from the lecture/readings for that week, and (b) raise at least one a thoughtful discussion question related to that point. The goal here is to get you to engage with material prior to coming to the synchronous discussion session and into a regular writing regular habit. Your lowest score will be dropped, so the best six will determine your grade.

Participation- Attending class is an essential aspect of learning for most students. The TA and instructor will be monitoring attendance and participation each week during the synchronous meeting. You are expected to come to the meeting prepared, having read the assigned material and watched the pre-recorded video lectures. You should expect to find some of the readings challenging – that is okay! The discussion session and lecture are designed to provide you with opportunities to ask questions and deepen your understanding of the material. To receive credit for a discussion session each week, you must make a meaningful contribution to our discussion – meaning that your question or comment reflects genuine effort to engage with the material. If you do not participate in discussion or are absent, you will not receive credit for participation that week; your lowest weekly participation grade will be dropped, meaning you are permitted one unexcused, no-questions-asked absence. Peer evaluation of the presentations in the two weeks you are not presenting (see article presentation below) will also count toward your participation grade.

Article Presentation- Weeks 11-13 will be devoted to applying the critical analysis of methods and designs from the first segment of the course to seminal and recent original research exemplifying those methods and designs. There will be no pre-recorded lectures these weeks. Instead, students will choose one week for which they will present (such that 6-7 students will be presenting each week) and will

submit a short (~15 minute) video presentation of their article. The presentation should describe the main claims and methods used in the article and should include critical engagement with the material based on the relevant material from the first segment of the course. Grades will be assigned based on both instructor and peer evaluation.

Article Review- The article review is a standalone critical writing assignment, designed to synthesize material from the first segment of the course through a critique of an original research paper. You will write one ~750-word review of a primary research paper from the material covered in Weeks 11-13. Your review should briefly summarize the main points from the paper and then raise critical questions based on corresponding material covered earlier in the course. Your article review must target material from a week other than the one for which you do your article presentation.

Grant Project- This is the capstone project for the course. Based on previously published data, you will develop a plan for future research and organize that plan into a grant application. Through this process you will learn what is expected from a real grant application, how to write one, and most importantly, how to support yourself and your ideas. The complete application will be approximately 2500 words, excluding references, and will serve as a capstone for the course. The assignment will be broken down into the following components and you will work on it throughout the semester.

(1) Letter of Intent (15%) – brief description of planned project, should sell the project in terms of importance and impact.
(2) Draft of Proposal (25%) – first full draft of proposal, try to get this version as polished as possible to minimize the revisions you'll need to do for the end of the term.
(3) Peer Review of Other Proposals (2, 10% each) – you will be assigned to comment on grant projects of two other students; you'll be graded on how thoroughly you review these proposals and the quality of your comments.
(4) Final Version of Grant (40%) – your final draft should build on the full draft you've compiled and should incorporate revisions based on feedback from both peers and the instructor. I will evaluate your projects both on how well you incorporated feedback and on how well your proposal meets the general requirements outlined for the grant project.

Policies

Late Work: Again, keep in mind that although the course has an online format, assignments still have firm due dates (see schedule). Reading responses will not be accepted late (though the lowest score will be dropped). Late assignments for the article presentation, article review, and all components of the grant project will incur a penalty of 10% per day late.
This policy may be modified on an individual basis at the discretion of the instructor. You must contact the instructor in advance of the due date to request a modification of the late penalty.

Communication: If you need to contact me, please do so **from your university email account only**. **Include the course name in the subject line and your name in the body of the e-mail**. Check your email and course Blackboard account daily – I will use both to communicate with you regarding changes to the course, syllabus, and other essential information. You are responsible for all announcements posted and sent via Blackboard and email.

Conduct: Be kind and respectful to your classmates. Disrespectful behavior may lead to deduction of points from the course, and further actions depending on the offense. For a guide to online behavior, see these core rules for Netiquette.

Academic Integrity and Plagiarism: It is expected that students adhere to the George Mason University Honor Code as it relates to integrity regarding coursework and grades. The Honor Code reads as follows: "To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student members of the George Mason University community pledge not to cheat, plagiarize, steal and/or lie in matters related to academic work." More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be found at the Office of Academic Integrity website at: http://oai.gmu.edu.

Cheating and plagiarism of any form are not tolerated. Plagiarism means using the exact words, opinions, or information from another person without giving the appropriate credit. Any offense will be referred to the Office of Academic Integrity and dealt with in accordance with university regulations.

Disability Accommodations
If you have a documented learning disability or other condition that may affect academic performance, you should (1) contact Office of Disability Services (ds.gmu.edu) and request accommodations, with appropriate documentation (ds.gmu.edu/forms/), and (2) talk with me to discuss your accommodation needs.

Mason Diversity Statement*
George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

This is an abbreviated statement, full statement is available at http://ctfe.gmu.edu/professional-development/mason-diversity-statement/

Privacy and Email Use
Students must use their Mason email account to receive important University information, including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address. Student privacy is protected under FERPA (https://registrar.gmu.edu/ferpa/).

Need Help? Check out these *Student Services*!
- Learning Services (learningservices.gmu.edu/keeplearning/)
- University Libraries (library.gmu.edu)
- Writing Center (writingcenter.gmu.edu)
- Counseling and Psychological Services (caps.gmu.edu)
- See a longer list of Mason student support services posted on The Stearns Center website.

Add/Drop Deadlines
Deadlines for the Fall 2022 semester can be found on the Mason Academic Calendar page.

What Will We Cover?

The Neuron Doctrine
- Neurons as the fundamental unit of information processing within the brain.
- History, debate, and alternative approaches.

Functional Localization
- History and the core goal of cognitive neuroscience.
- Neuropsychology and lesion studies.
- Classic case studies – dual visual stream, HM.
- Critiques of locality, issues with multifunctionality.

fMRI Methodology and Inference
- Basics of functional neuroimaging, history of neuroimaging – PET and fMRI.
- The BOLD signal as a proxy for neural activity.
- Basic experimental designs – block designs, subtractive designs.
- Debate around reverse inference.
- Network neuroimaging methods.

Animal Studies and Generalization to Humans
- Model Organisms – how and why they are chosen.
- Ethical considerations in studies with non-human animals.
- Operationalization and limitations in generalizing to humans.

Weeks	Lessons	Material	Due Dates
Week 1 Aug 22- Aug 26	Introduction	Synchronous Meeting 8/24 3:00pm • Introductions • Review of course and syllabus • Read Welcome page Asynchronous Work • Review Syllabus and Course Schedule • Optional: Meet the Instructor during drop-in office hours Thursday 9am-10am	Nothing Due
Week 2 Aug 29- Sept 2	Scientific Writing	Asynchronous Work • No Reading Assignment • Watch Scientific Writing Lecture Videos • Read and Watch Plagiarism and materials • Read Citations and References materials • Brainstorm research ideas for grant projects Synchronous Meeting 8/31 3:00pm • Review Grant Project Guidelines (due at end of semester) • Sign up for article presentations	Due Tuesday 8/30 11:59pm • Email me with a rough idea you might be interested in working on for your grant project. Due Friday 9/2 11:59pm • Sign up for article presentations
Week 3 Sept 5- Sept 9	Signaling in the Brain: The Neuron Doctrine	Asynchronous Work • Watch Neuron Doctrine Lecture Videos • Read Signaling in the Brain Articles • Write First Reading Response Synchronous Meeting 9/7 3:00pm • Discuss Signaling in the Brain Articles	Due Wednesday 9/7 12:00pm • 1st Reading Response
Week 4 Sept 12- Sept 16	Lesion Studies	Asynchronous Work • Watch Lesion Studies Lecture Videos • Read Week 4 Articles • Write Second Reading Response	Due Wednesday 9/14 12:00pm • 2nd Reading Response

		Synchronous Meeting 9/14 3:00pm • Discuss Lesion Studies Articles	
Week 5 Sept 19-Sept 23	Localization	Asynchronous Work • Watch Localization Lecture Videos • Read Week 5 Articles • Write Third Reading Response Synchronous Meeting 9/21 3:00pm • Discuss Localization Articles	Due Wednesday 9/21 12:00pm 3rd Reading Response
Week 6 Sept 26-Sept 30	fMRI Intro and Limits	Asynchronous Work • Watch fMRI Intro Lecture Videos • Read Week 6 Articles • Write Fourth Reading Response Synchronous Meeting 9/28 3:00pm • Discuss fMRI Intro and Limits Articles	Due Wednesday 9/28 12:00pm • 4th Reading Response
Week 7 Oct 3-Oct 7	fMRI Inferences	Asynchronous Work • Watch fMRI Inferences Lecture Videos • Read Week 7 Articles • Write Fifth Reading Response Synchronous Meeting 10/5 3:00pm • Discuss fMRI Inferences Articles	Due Wednesday 10/5 12:00pm • 5th Reading Response
Week 8 Oct 10-Oct 14	Article Review and Presentation	Fall Break (Monday, Oct 10) Asynchronous Work • Watch Article Review and Presentation Lecture Videos • Work on Letter of Intent • One-on-one meetings available No Synchronous Meeting this Week	Due Friday 10/14 11:59pm **Grant Project – Letter of Intent**
Week 9 Oct 17-Oct 21	Model Organisms: Part I	Asynchronous Work • Watch Model Organisms: Part I Lecture Videos • Read Week 9 Articles • Write Sixth Reading Response Synchronous Meeting 10/19 3:00pm • Discuss Model Organisms: Part I Articles • Grant Project: Next Steps Discussion	Due Wednesday 10/19 12:00pm • 6th Reading Response

		Synchronous Meeting 9/14 3:00pm • Discuss Lesion Studies Articles	
Week 5 Sept 19-Sept 23	Localization	Asynchronous Work • Watch Localization Lecture Videos • Read Week 5 Articles • Write Third Reading Response Synchronous Meeting 9/21 3:00pm • Discuss Localization Articles	Due Wednesday 9/21 12:00pm 3rd Reading Response
Week 6 Sept 26-Sept 30	fMRI Intro and Limits	Asynchronous Work • Watch fMRI Intro Lecture Videos • Read Week 6 Articles • Write Fourth Reading Response Synchronous Meeting 9/28 3:00pm • Discuss fMRI Intro and Limits Articles	Due Wednesday 9/28 12:00pm • 4th Reading Response
Week 7 Oct 3-Oct 7	fMRI Inferences	Asynchronous Work • Watch fMRI Inferences Lecture Videos • Read Week 7 Articles • Write Fifth Reading Response Synchronous Meeting 10/5 3:00pm • Discuss fMRI Inferences Articles	Due Wednesday 10/5 12:00pm • 5th Reading Response
Week 8 Oct 10-Oct 14	Article Review and Presentation	Fall Break (Monday, Oct 10) Asynchronous Work • Watch Article Review and Presentation Lecture Videos • Work on Letter of Intent • One-on-one meetings available No Synchronous Meeting this Week	Due Friday 10/14 11:59pm **Grant Project – Letter of Intent**
Week 9 Oct 17-Oct 21	Model Organisms: Part I	Asynchronous Work • Watch Model Organisms: Part I Lecture Videos • Read Week 9 Articles • Write Sixth Reading Response Synchronous Meeting 10/19 3:00pm • Discuss Model Organisms: Part I Articles • Grant Project: Next Steps Discussion	Due Wednesday 10/19 12:00pm • 6th Reading Response

Week 10 Oct 24- Oct 28	Model Organisms: Part II	Asynchronous Work • Watch Model Organisms: Part II Lecture Videos • Read Week 10 Articles • Write Final Reading Response Synchronous Meeting 10/26 3:00pm • Discuss Model Organisms: Part II Articles • Grant Project: Next Steps Discussion	Due Wednesday 10/26 12:00pm 7th Reading Response
Week 11 Oct 31- Nov 4	Research Article - Neuropsychology	Asynchronous Work • Watch Group 1 Peer Article Presentation Videos • Read Week 11 Articles • Complete Peer Review Assessment for Each Presentation (unless you're in Group 1) Synchronous Meeting 11/2 3:00pm • Discuss Neuropsychology Articles	Due Monday 10/31 8:00am • Group 1 Video Presentations Due Wednesday 11/2 12:00pm • Group 2 and 3 Peer Evaluations
Week 12 Nov 7- Nov 11	Research Article – fMRI Experiments	Asynchronous Work • Watch Group 2 Peer Article Presentation Videos • Read Week 12 Articles • Complete Peer Review Assessment for Each Presentation (unless you're in Group 2) Synchronous Meeting 11/9 3:00pm • Discuss fMRI Experiments Articles	Due Monday 11/7 8:00am • Group 2 Video Presentations Due Wednesday 11/9 12:00pm • Group 1 and 3 Peer Evaluations
Week 13 Nov 14- Nov 18	Research Article – Animal Studies	Asynchronous Work • Watch Group 3 Peer Article Presentation Videos • Read Week 13 Articles • Complete Peer Review Assessment for Each Presentation (unless you're in Group 3) Synchronous Meeting 11/16 3:00pm • Discuss Animal Studies Articles	Due Monday 11/14 8:00am • Group 3 Video Presentations Due Wednesday 11/16 12:00pm • Group 1 and 2 Peer Evaluations
Week 14 Nov 21- Nov 25	Thanksgiving Break	No Synchronous Meeting Individual Meetings with Dr. Boone available Nov 21 and 22.	Due Tues 11/22 11:59pm • **Grant proposal draft for peer review**

| Week 15 Nov 28- Dec 2 | Grant Project Peer Review | No Synchronous Meeting

Asynchronous Work
• Submit Grant Project Peer Reviews
• Work on Article Review Assignment
• Work on final draft of Grant Project | Due Monday 11/28 11:59pm Grant Project Peer Reviews

Due Friday 12/2 11:59pm Article Review

Due Tuesday 12/6 11:59pm **Final draft of Grant Project** |
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NOTE: This schedule may be subject to change at any time. **You are responsible for all announcements and syllabus modifications posted to Blackboard. Check your Mason email and Blackboard announcements daily.**