

HD 2200
Human Brain and Mind: Introduction to Cognitive Neuroscience
Fall 2020

This course will examine the neurobiological basis of human behaviour, with particular emphasis on cognitive functioning. The course will begin with an introduction to fundamental concepts in neuroscience including neuroanatomy, neural signals, and cortical organisation along with an overview of methods and tools commonly used by neuroscientists. This will be followed by an exploration into specific areas of basic and higher order cognitive function.

Instructor: Elvisha Dhamala

Textbook: *Cognitive Neuroscience 5th Edition* (Editors: Gazzaniga, Ivry, Mangun)

Course Objective

Students will learn how the brain produces fundamental cognitive functions such as sensation, movement, memory, attention, and emotion. Students will develop a working knowledge of the brain's structure and function and demonstrate comprehension of the neural bases of disorders related to cognitive dysfunction.

Desired Outcomes

By the end of the course, students will be able to:

1. Identify and describe major neural structures and pathways.
2. Define methods used in neuroscience to study human brain and behaviour.
3. Explain the neural bases of basic and higher level cognitive processes.
4. Analyse how neurological disorders can affect different brain structures or pathways, and infer how that may influence cognition and behaviour.
5. Apply neuroscientific principles to analyse readings, podcasts, and movies about the brain.

Course Reader

This course will use a course reader which includes readings and scientific articles that will be used to supplement the course material and textbook. Students will use these readings and articles to enhance their understanding of the human brain and mind.

The reader includes four chapters from Oliver Sacks' *The Man Who Mistook His Wife For A Hat and Other Clinical Tales*. Oliver Sacks was a British neurologist who believed that the brain is the "most incredible thing in the universe". He is well-known for his collections of case studies of individuals with neurological disorders. In his book, *The Man Who Mistook His Wife for a Hat and Other Clinical Tales*, Sacks tells a collection of stories about individuals afflicted with a variety of unusual neurological abnormalities.

The reader also includes two scientific articles. The first explores how viral infections can affect the nervous system, and the second provides an in-depth review of how structural and functional networks in the brain produce cognition.

Course Overview

The course content will be separated into modules. The topics and textbook chapters corresponding to each module are listed below.

Module	Topics	Textbook Chapters	Corresponding Assignments and Reflections*
Introduction and Methods	History of Cognitive Neuroscience	1	A1
	Structure and Function of the Nervous System	2	A2
	Scientific Method & Methods in Neuroscience	3	A3
	The Lateralised Brain	4	A4, R1
Basic Cognitive Processes	The Five Senses	5	A5
	Attention	7	A6
	Memory	9	A7, R2
	Emotion	10	A8, A9
	Language	11	A10, R3
Higher Level Cognition	Cognitive Control	12	A11
	Social Cognition	13	A12
	Consciousness	14	R4

*A denotes an assignment and R denotes a reflection.

A detailed course timeline including specific dates and topics can be found on the next page.

Course Timeline

The semester will be broken down into four 3-week sections followed by a final 1-week section. A detailed overview of what each section will cover is below.

Tentative Timeline*	Module	Overview	Assessments
Section 1: Sept. 21 - Oct. 11	Introduction and Methods	This course will start with a brief overview of the history of neuroscience will be followed by an introduction of the structure and function of the nervous system. The focus will be on the organisation of the nervous system and how neurons communicate with one another. Next, different methods used in neuroscience to study the human brain will be explored. Finally, similarities and differences between the two hemispheres of the brain will be examined. Students will be responsible for Chapters 1-4 of the textbook and <i>The Man Who Mistook His Wife For A Hat</i> excerpt.	Assignments 1-4 will be based on Chapters 1-4. Reflection 1 will be based on <i>The Man Who Mistook His Wife For A Hat</i> .
Section 2: Oct. 12 - Nov. 1	Basic Cognitive Processes: Part I	This section will start by exploring the five basic senses, with particular focus on the neural pathways important for each of the senses. Next, attentional mechanisms and the networks that are responsible for attention will be discussed. Finally, how memories are created, stored, and accessed will be studied. Students will be responsible for Chapters 5, 7, and 9 of the textbook and <i>The Lost Mariner</i> excerpt. Students are also expected to watch <i>Still Alice</i> .	Assignments 5-7 will be based on Chapters 5, 7, and 9. Reflection 2 will be based on <i>The Lost Mariner</i> and <i>Still Alice</i> .
Section 3: Nov. 2 - Nov. 22	Basic Cognitive Processes: Part II	This section will focus on emotion and language. Theories of emotion generation will be discussed, followed by an in-depth exploration into mental health and society. Next, the anatomy of language function will be explored with emphasis on language deficits and disorders. Students will be responsible for Chapters 10-11 of the textbook and <i>The President's Speech</i> excerpt. Students are also expected to listen to <i>Mental Health Part 1: Origins, Mental Health Part 2: 1700s to 1900s, Mental Health Part 3: The 20th Century and Mental Health Part 4: The 21st Century</i> .	Assignments 8 and 10 will be based on Chapters 10-11. Assignment 9 will be based on the <i>Mental Health</i> podcast episodes. Reflection 3 will be based on <i>The President's Speech</i> .
Section 4: Nov. 23 - Dec. 13	Higher Level Cognition	This section will focus on higher order cognitive functions, social cognition, and consciousness. First, the neurological basis of goal-oriented behaviours and decision making will be discussed. Next, social cognition and associated deficits will be explored. Finally, levels of arousal and consciousness will be covered with emphasis on disorders with loss of consciousness. Students will be responsible for Chapters 12-14 of the textbook and <i>The Passage to India</i> excerpt.	Assignments 11-12 will be based on Chapters 12-13. Reflection 4 will be based on <i>The Passage to India</i> .
Section 5: Dec. 14 - Dec 21	Wrap-Up	Students will have this final week to work on their experimental proposals. More details about the experimental proposal are below.	Experimental Design Proposal

*Exact dates may change depending on our progress and your feedback.

Grade Breakdown

Students will be evaluated using assignments, reflections, and an experimental design proposal as follows:

Description	Details	Total
Assignments	12 assignments x 5% each	60%
Reflections	4 reflections x 5% each	20%
Experimental Design	1 proposal	20%

Assignments

The course will include twelve assignments. Each assignment will focus on a specific chapter of the textbook or additional materials. Detailed instructions will accompany each assignment and students will have a few weeks to work on each one. Each assignment is worth 5% of the students' grade, and the ten assignments will make up 60% of the total grade.

Reflections

The course will include four reflections. Each reflection will be based on additional readings, and will ask students to reflect on how neuroscientific principles can be applied to better understand specific phenomena. Detailed instructions will accompany each reflection assignment. Each reflection is worth 5% of the students' grade, and the four reflections will make up 20% of the total grade.

Experimental Design

Research is the foundation of science. Through extensive research, scientists are able to make new discoveries, enhance existing concepts, and refute inaccurate theories about the brain. Instead of a final exam, the course will require students to integrate their knowledge of the human brain and mind and scientific principles as covered throughout the course to propose their own research experiment. Students will be asked to choose a neurological disorder and propose an experiment they would conduct to research the disorder.

Tentative Timeline	Experimental Design Proposal Milestones	Grade
Section 1: Sept. 21 - Oct. 11	Students will identify the neurological disorder they will be focusing on for their experimental design proposal. Students will also come up with the question they are hoping to answer.	10%
Section 2: Oct. 12 - Nov. 1	Students will propose at least two different methods they will incorporate into their experiments. Students must explain how these methods can be used to answer their research question.	10%
Section 3: Nov. 2 - Nov. 22	Students will develop hypotheses (including the null hypothesis) about what they might find from their proposed experiments. Students will also identify potential limitations and pitfalls and propose solutions.	20%
Section 4: Nov. 23 - Dec. 13	Students will have this time to work on their proposals.	
Section 5: Dec. 14 - Dec 21	Students will complete and submit their final experimental design proposals.	60%
Total		100%

At the end of each session, students will submit the required materials for the proposal. I will be providing feedback at each step of the way so students can use it to improve their proposals during the last two sections of the course.

Evaluations

This course includes assignments, reflections, and an experimental design proposal. I have spent a lot of time thinking about what is most important in terms of your learning in designing this course. Given the unconventional teaching circumstances for this course, I understand that some of the assignments and reflections might be challenging without the ability to have in-depth in class discussions. While I do aim to help you develop a strong understanding of main ideas presented in the textbook material, you will not be expected to memorise minute details. Additionally, many of the assessments will require you to critically analyse the material. Many of the questions included in the assignments and reflections will not have right or wrong answers; they instead will encourage you to think creatively and critically about the human brain and behaviours. I will also be providing you with detailed feedback on all of the work that you submit so you are able to identify your strengths and weaknesses and focus on your growth. Therefore, there are a few key expectations I have for you when completing your assignments and reflections:

1. Think deeply about the main ideas being conveyed each week.
2. Show me your thinking and help me understand how you got to the answer that you did.
3. Use the feedback you are given to help you grow and evolve your thinking over time.
4. Engage with one another and the material.
5. Ask for help when you need it.

Section Reviews

Along with your completed assignments and reflections for each section, I encourage you all to also send me a brief paragraph about how you feel about the course thus far. Feel free to tell me which topics you found most interesting, concepts you did or did not understand, and materials you found most useful. You're also welcome to let me know if there's anything specific you would like feedback on or help with so that you can understand the material best. Finally, I also encourage you to tell me how I can improve for the next sections. Please tell me if something isn't working and how I can help you learn better.

Late and Missed Assessments

Students must submit all assessments (assignments, reflections, experimental design proposal) for each section at the end of the section. At the absolute latest, assessments must be received within a week after the end of a section. Specific due dates will be noted for each section.

Late submissions are subject to a 10% penalty per week. Assessments submitted more than two weeks after the end of a section will be considered missed and students will receive a 0% for that assessment.

It is extremely important that you get your work to me on time so that we are all able to smoothly progress through the course. Receiving all of your work on time will also enable me to get them back to you promptly so you can use them as reference in your future work for the course. If you are not able to get in a particular assessment on time due to extenuating circumstances, please let me know as soon as possible.

What to Expect

Distance learning is extremely difficult; I have no doubt that this semester, with its unconventional teaching and learning approaches, will be filled with challenges. But, I will do my best to teach you about the human brain and mind. I will provide you with the resources you will need to learn. This means I will work tirelessly to figure out how you, the students, learn best, and adapt my teaching to meet those needs. This also means that I will need your help. I need you to let me know what methods and approaches work for you, what you do and don't understand, and how I can better support you in your learning. I welcome any and all feedback throughout the course so I can ensure that we can all make the most of the time we have together.

This course will be taught in a way that not only conveys topics in neuroscience to you, but also engages you and expects you to think critically about the human brain and mind. I will be incorporating video lectures, readings, podcasts, and a movie into the course. These will help bridge the gap between the concepts as they are presented in the textbook and the real world. This means I want you to really learn and understand the material and not just regurgitate the textbook to me.

Collaborations

The study of the human brain is fascinating yet complicated. Given the unconventional teaching format, I encourage you all to work together as we go through the course. I often find that I learn best with discussing concepts with others because it helps me not just know the material but also understand it to a deep level. I will do my best to make the video lectures as interesting as possible but I need you to also engage with the material with one another as much as possible. Students are expected to submit their own work based on their own thoughts and understanding of the material but are welcome to work together understand the material. For academic integrity purposes (see below), I request that you please note in your assignments and reflections the names of other students in the class with whom you've discussed that specific material.

Academic Integrity

The following academic integrity statement is adapted from *The Essential Guide to Academic Integrity At Cornell*, August 2020:

Absolute integrity is expected of every student in all academic undertakings. Integrity entails a firm adherence to a set of values, and the values most essential to an academic community are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others. Academic integrity is expected not only in formal coursework situations, but in all relationships and interactions connected to the educational process, including the use of resources. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. In addition, students have a right to expect academic integrity from each of their peers.