# POTH 455 NEUROPHYSIOLOGY

**Credits:** 3

**Prerequisites:** PHGY209 Mammalian Physiology 1 – 3 credits and
PHGY210 Mammalian Physiology 2 – 3 credits or
an equivalent knowledge base as judged by the professors

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**Communication plan:** Students should post content-related questions on the discussion board of myCourses. For personal queries, course coordinators and instructors can be reached by email. In most circumstances, emails will be answered within 1 business day. Individual in-person, phone or Zoom meetings will be set when necessary.

The instructors and TAs will be responsible for evaluating specific assignments. Questions about the evaluations should be directed to the teaching assistant(s).

**Course Description:** This course aims provide the student with neurophysiological principles, concepts and mechanisms useful for understanding the nervous system and its aberrations in pathologies that impact upon the functioning of the individual. These principles will be illustrated by reference to normal brain functions in animals and man as well as through illustrations of the effects of their disruption in diseases and other conditions that compromise the normal functioning of the nervous system. The course also aims to prepare future rehabilitation professionals (Occupational and Physical Therapists) in the applied neurophysiological principles required to excel in clinical practice. At the end of this course, the student will understand the function of major brain structures and will have learned signs and symptoms of some important neurological disease processes that illustrate principles of brain function.

**Course Structure:** The course will offer a blended learning approach which will consist of in-person lectures and in-person clinical cases to link neurophysiological principles to neurological conditions.

**Student Learning Objectives:** This course will cover essential competencies and milestones related to the domains of **expertise**, **communication**, **collaboration** and **scholarship**. Upon completion of this course, the student will be able to:

| **Course Objectives and Related Assignments** | | | | | |
|---|---|---|---|---|---|
| | | **Exams** | **Preparatory quizzes** | **In-class Reflection** | **Presentation** |
| *Expert* | 1. **Describe** neurophysiological concepts, principles and mechanisms underlying normal functioning and **explain** their relationships to normal and pathological functioning of the individual. | √ | √ | | √ |
| | 2. **Identify** key components of the etiology, epidemiology and clinical characteristics of common neurological conditions associated with malfunctioning of brain structures and **appreciate** factors leading to a differential diagnosis. | √ | √ | | √ |
| | 3. **Identify** key components of the medical treatment, surgical interventions and rehabilitation associated with common neurological conditions and **understand** the impact of such treatment on the functional outcome of clients. | √ | √ | | √ |

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|---|---|---|---|---|---|
| *Communicator* | 4. **Employ** effective and appropriate verbal and nonverbal communication with lay public, peers and educators | | | √ | √ |
| *Collaborator* | 5. **Establish** and **maintain** interprofessional and intraprofessional relationships while understanding the roles and responsibilities of team members. | | | √ | √ |
| *Scholarly Practitioner* | 6. **Organize** available information about the neurological conditions presented and **select** information that is potentially important in regard to their needs as future rehabilitation specialists. | | | √ | √ |
| | 7. **Apply** basic literature search and reporting principles. | | | | √ |

Course Materials:

- **Required text:** Purves, D, Augustine G.J., Fitzpatrick D, Hall W.C., LaMantia A.-S., Mooney R.D., Platt M.L, White L.E. (2022) Neuroscience (7th ed) Sinauer Associates: Sunderland, MA.
- **Required readings:** Readings for each week will be posted on myCourses
- **Lecture material:** All lecture material will be made available on myCourses before the time of the lecture as PowerPoint slides, recorded lectures, Word documents and/or web links.
- **Useful resources:** A list of resources that you may find useful is provided in Appendix B

**Instructional Method:**

- Lectures, case studies, presentations and exams will be held in person.
- During the in-person case studies, the clinician will provide a short overview of the condition and case. The students will then be split into small groups to answer specific questions related to the case for ~20 min. The class will then reconvene as a large group, and small each group will share their answers. The invited clinician will provide opportunities for students to discuss and validate their answers.
- All course material can be found grouped by class period on myCourses.
- You can find information on these platforms by consulting the McGill Remote Learning Resources.
- Polling may be used in this course to enhance engagement and increase interactivity.
- For any technical problems with polling, please contact the IT Service Desk: https://www.mcgill.ca/it/students.
- If you do not have a phone, tablet, or laptop to use to respond to polling questions, please contact the instructor immediately in order for appropriate arrangements to be made.
- To maintain a safe and respectful classroom environment, please ensure that any polling responses you submit are appropriate and relevant to the question asked. Please note that unless the poll is labelled as anonymous, your responses are identifiable to the instructor. Please see the Code of Student Conduct and Disciplinary Procedures.

**Student Assignment & Evaluation:**

| Assignment Type | Format | Due Date | % of final grade |
|---|---|---|---|
| Preparatory quizzes | - Weekly set of multiple-choice and fill-in the blank questions to prepare for the case presented by a clinician.<br>- Best 9/10 will count towards the final grade. | Each week before 12:30 PM (ET) on the day of the presentation. | 15% |
| In-class Reflection | - Following each case presentation, students will be asked to answer 1 question about the topics discussed in class. 10/11 in-class reflections will count, including the reflection after the student presentations where everyone is expected to be present. | End of each class | 10% |
| Midterm Exam | - Midterm exam containing multiple choice and short answer questions that cover the course material from week 1 to week 5. | October 11th, Time 12:30-14:30 (2 hours) | 25% |
| Presentations | - Group presentations on the assessment and treatment of a client with a neurological condition & 1-page completed condition resource tool. | Nov. 8th | 15% |
| Final Exam | - Final exam containing multiple choice and short answer questions that cover from week 6 to week 14. | Final Assessment period | 35% |

**Special Requirements for Course Completion & Program Continuation:** In order to pass the course, a grade of at least C+ (60%) must be obtained as a total course mark. A supplemental exam is permitted in this course. Please refer to the McGill University Health Sciences Calendar for information on University regulations regarding final examinations and supplemental examinations. The modalities used for remedial work will be determined by the instructors on a per case basis.

**Plagiarism/Academic Integrity:** McGill University and the Faculty of Medicine and Health Sciences value academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the McGill University Code of Student Conduct and Disciplinary Procedures and the Faculty of Medicine and Health Sciences Code of Conduct

Students have the responsibility and accountability for maintaining academic integrity and being transparent in their use of AI tools in their assignments. This involves both verifying the accuracy of information generated and acknowledging the use of generative AI tools (such as ChatGPT), if applicable.

*L'université McGill et la Faculté de Médecine et des Sciences de la Santé attachent une haute importance à l'honnêteté académique. Ils incombent par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les*

*conséquences que peuvent avoir de telles actions, selon le Université de McGill Code de conduite de l'étudiant et des procédures disciplinaires et Faculté de médecine et des sciences de la santé.*

**IMPORTANT:** The instructors may make use of text comparison software to compare the work submitted with that of previous years.

**Right to submit in English or French written work that is to be graded**: In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

*Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté, sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue.*

**Assessment:** The Policy on Assessment of Student Learning exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and methods of student assessment, e.g. the timing of evaluation due dates and weighting of final examinations.

**Consequences of not completing assignments as requested:** An individual who does not complete a required assignment and who does not have a university-recognized reason for deferral will receive a 0 in that portion of the course. Assignments submitted late will receive a deduction of 2% per day, including weekends.

**Assessment deferrals:** In the case that the midterm assessment cannot be completed on the date specified above, an oral examination (examining the same content) will be completed with the professors at a specified date. In the case of a deferred presentation, a student can exceptionally record their section so that it can be played during the group presentation.

**Code of conduct:** Professionalism with respect to dressing is encouraged throughout the course of the semester as guest clinicians, researchers and professors are often present. Out of respect for all, a student who is late to class should be careful to avoid slamming the door when entering class. The same care should be taken when exiting/entering class while someone is presenting. Breaks are provided between each hour of lecture, so out of respect for all, students are asked to refrain from talking to each other, eating loudly or making distracting noises, while a guest is present. Students should understand and adhere to the code of conduct for professional email communication, including confidentiality, appropriate language, and respectful tone.

**Copyright of course materials:** Instructor-generated course materials (e.g., handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow-up by the University under the Code of Student Conduct and Disciplinary Procedures.

**Course Accessibility:** *"As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the* Student Accessibility and Achievement*, 514-398-6009."*

**Course evaluations**: End-of-course evaluations are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.

Additional policies governing academic issues which affect students can be found in the Academic Rights and Responsibilities

**In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.**

## Assignment Details

1. **Preparatory quizzes (15%)**
   - Every week, a clinician will present a neurological condition that they encounter in their practice during an in-person case study.
   - Case studies and guiding questions related to the neurological condition under discussion will be posted via myCourses in the file for the corresponding lecture.
   - In order to optimize your learning experience and allow for an interactive session, you will be asked to complete an online quiz before each case presentation.
   - The questions are not designed to be tricky or difficult but are meant to assess your comprehension of the condition and of the readings in order to prepare for the clinical case presentations. Cases are constructed to emphasize signs & symptoms, treatment options and topics relevant to the neurological condition discussed.
   - Each quiz will consist of 4-5 multiple choice or fill-in the blank questions based on the reading material, associated with the neurological condition and the case-related readings.
   - The preparatory work quiz will be made available in the quiz section of myCourses one week prior to the corresponding case study and will have to be completed by 12:30 PM (ET) on the day of the case study.
   - When you start the quiz, you will have 30 minutes to complete it.
   - There will be a total of 10 preparatory quizzes, one for each case presentations. The 9 quizzes with the highest marks will count towards the final grade.

2. **In-class participation (10%)**
   - Following each case presentation and the group presentations, students will be asked to answer 1 question about the topics discussed in class.
   - Students will have time provided at the end of each case study to answer the question.
   - The question will be handed in by the end of class.
   - Each participation question is worth 1%. 10/11 in-class reflections will count, including the reflection after the student presentations where everyone is expected to be present.

3. **Midterm exam (25%)**
   - The midterm will last 2 hours and will consist of multiple choice, fill-in the blank and short answer questions. Questions will be based on the readings, lectures & case study material associated with the subjects covered in weeks 1 to 5.

4. **Presentation (15%, group project)**

Groups and topic selections

- This project will be done in groups of 4 or 5 students that will be assigned on myCourses.
- Each group will be assigned a different case.

Presentation

- Students will be asked to submit their slides & 1-page condition resource tool in the assignment folder on MyCourses by Nov. 8th 12:00 PM (noon).

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McGill University is situated on the traditional territory of the Kanien'kehà:ka, a place which has long served as a site of meeting and exchange amongst nations. We recognize and respect the Kanien'kehà:ka as the traditional custodian of the lands and waters on which we meet today.

- The presentation & slides must address the following topics that are based on the **Condition Resource Tool** (Appendix A):
    1. Neurological aspects (Etiology)
    2. Epidemiological aspects
    3. Clinical aspects (Signs & symptoms)
    4. Functional implications for this person
    5. Treatments: Important medical treatment with emphasis on possible OT/PT treatment interventions.
- The 1-page completed **Condition Resource Tool** must also be submitted but is NOT examinable material for students. The completed condition resource tool should be size 10, arial, single-spaced, using the table provided.
- A detailed grading rubric will be available on myCourses.
- Students will also have **6 minutes** for their presentation (including the case description)
- An instructor will also ask students at least one question.

**5. Final exam (35%)**

- The final exam will last 3 hours and consist of multiple choice, fill-in blank and short answer questions. Questions will be based on the readings, lectures & case study material associated with the subjects covered in weeks 6 to 14.

**Appendix A: Condition Resource Tool**

| Neurological condition: _____ | |
|---|---|
| **1. Neurological aspects (Etiology)** | **a. When someone is found to have this condition what part of the nervous system has been affected and what brain functions are affected, and how?** *(Ex: central versus peripheral nervous system, sensory versus motor cortex, dopamine versus serotonin)* |
| | **b. For this condition, what are the probable causes of the alteration observed in the normal nervous system?** *(Ex: anoxia, atrophy, trauma, demyelination)* *The answers to question 1 and 2 often overlap.* |
| **2. Epidemiological aspects** | **a. What are the factors more often associated with an increased risk of developing this medical condition?** *(Ex: hypertension, diabetes, heredity)* |
| | **b. Is this medical condition more commonly seen in a specific group of individuals?** *(Ex: male vs female, old vs young, caucasians vs hispanics* |
| **3. Clinical aspects (Signs & symptoms)** | **a. What are distinctive clinical signs and symptoms associated with this medical condition? What are the principal factors needed for a differential diagnosis?** *(Ex: hemiplegia, ataxia, tremor, loss of short-term memory)* |
| | **b. Are other impairments associated with this condition?** *(Ex: hydrocephalus and cognitive impairments are often associated with spina bifida)* |
| **4. Functional implications** | **a. What are the functional implications of this medical condition? i.e. What are the activity restrictions and participation limitations to be encountered in an individual's daily activities?** *(Ex: Is there an increased probability of falls? What are the limitations for the person?)* |
| **5. Treatments** | **a. What are the most common medical and OT/PT treatments currently in use for this condition?** *(E.g.: rTPA, Ritalin, surgery, strengthening, constraint-induced therapy, diet restrictions, etc.)* **For each of these medical treatments consider:** • The clinical signs and symptoms alleviated by this treatment. • How the treatment acts on the clinical signs and symptoms. • The positive and negative impacts of the medical, surgical and/or rehabilitation treatment on functional outcomes of the individual. |

## Appendix B: Useful References

**Texts:**


- Perkin, G.D. (2002). *Mosby's Color Atlas and Text of Neurology* (2nd ed.). Toronto: Elsevier Science.
- Greenberg, D.A., Aminoff, M.J., Simon, R.P. (2002) *Clinical neurology* (5th ed.). New York: McGraw – Hill.
- Netter, F.H. (1991) *The CIBA Collection of Medical Illustrations* (Vol 1 Nervous System Part I Anatomy and Physiology). New Jersey: CIBA-GEIGY
- Netter, F.H. (1991). *The CIBA Collection of Medical Illustrations* (Vol 1 Nervous System Part II Neurologic and Neuromuscular Disorders). New Jersey: CIBA-GEIGY.
- Kandel, E.R., Schwartz, J.H., Jessell, T.M., Siegelbaum, S.A., Hudsoeth, A.J. (2013). *Principles of Neural Sciences* (5th ed.). New York: McGraw Hill.
- Bear, M.F., Connors, B.W., Paradiso, M.A. (2001). *Neuroscience- Exploring the Brain*. (2nd ed.). Baltimore: Lippincott Williams & Wilkins.
- Umphred, D.A. (2007) *Neurological Rehabilitation* (5th ed.) St. Louis: Mosby Elsevier.
- Blumfeld, H. (2002) Neuroanatomy through Clinical Cases. Sinauer Associates, Sunderland, MA 951 p.


**Websites:**

- McGill Web site for Resources in Rehabilitation (address retrieved July 31st, 2020): http://libraryguides.mcgill.ca/poth
- National Library of Medicine: http://www.nlm.nih.gov/medlineplus/healthtopics.html
- Canadian Stroke Network: http://www.canadianstrokenetwork.ca/
- National Institute of Neurological Disorders and Stroke: https://www.ninds.nih.gov/