



College of Natural Science

MICHIGAN STATE UNIVERSITY

Syllabus

PSL 460 - Topics in Physiology

Section 1: Synapses, neurons, and circuits – from function to disease

Spring Semester 2025

Wednesdays 12:40 pm - 2:30 pm

Dates: 1/13/25 – 4/27/25

Course Modality and Location: In-Person, 3280 BPS Building

Note: Dr. Vogt's lecture and presentations will be via Zoom (Feb 12th and 19th). I will post the Zoom link D2L.

Course Website Address: <https://d2l.msu.edu>

2 credits (2 hours/week)

Instructor:

Dr. Shane R. Crandall

Office:

Room 2197 Biomedical & Physical Sciences Bldg

Office Phone:

517-884-5055

Email:

cranda86@msu.edu

Office hours:

Tuesday 11:30 am – 12:30 pm or email to schedule an appointment

Course Description:

PSL 460 section 1 will examine recent advancements in neuroscience research, especially our understanding of how the forebrain functions and the pathological processes underlying certain mental and neurological disorders.

Course Goals and Objectives:

1. Reinforce and increase your knowledge of neuroscience, neurophysiology, and the advanced techniques used in neuroscience research.
2. To become familiar with the style and format of primary literature used to present and interpret research findings.
3. Acquire the ability to critique primary literature.
4. Learn how to communicate effectively through both oral and written presentations.

Prerequisites:

PSL 431 and 432, and completion of Tier 1 writing requirement.

Required and Recommended Textbook & Course Materials:

None required. However, students must be able to access MSU library electronic resources <https://lib.msu.edu>.

Required Technologies:

Students must have a computer or tablet to access MSU library electronic resources, PubMed, and electronic journals. Students must also have PowerPoint or similar software to prepare and give their presentations.

If classes are moved online, students must have a computer or tablet that allows for screen sharing during Zoom meetings and is equipped with a built-in or external microphone and webcam for oral presentations and class participation.

Course Platforms:

This course will be delivered **in person** and involve **active discussion** among the entire class. Therefore, attendance and participation are critical for success.

Students should contact Dr. Crandall immediately if they are unable to attend class. In such cases, students will still be required to complete an additional assignment to make up for their participation grade.

Dr. Crandall will use **D2L** to communicate with students and distribute required and recommended readings. The student's MSU NetID is required to log into the course through the D2L homepage (<https://d2l.msu.edu>).

If there is a significant outbreak of Covid 19, we will use **Zoom** for synchronous class meetings and student presentations.

Technical Assistance:

MSU IT Service Desk at 517-432-6200, 884-678-6200, or ithelp@msu.edu
 D2L Help Site at <https://help.msu.edu> or <https://help.d2l.msu.edu>
 Zoom help at MSU IT Service Desk or <https://support.zoom.us/hc/en-us>

Course Grading Policy:

The student will be responsible for assigned readings and learning any background information provided by Dr. Crandall. A student's final grade in this course will be based on the following:

- Weekly written critiques and in-class participation (~40%)
- Final written report (~30%)
- Oral presentations (~30%)

Each day an assignment is late will result in a 10% deduction from the grade. Thus, a written report turned in three days late will receive, at best, 70% credit.

Grades are based on the percentage of possible points (see below).

<u>% of possible points</u>	<u>Grade</u>
90-100	4.0
85-89.9	3.5
80-84.5	3.0
75-79.9	2.5
70-74.9	2.0
65-69.9	1.5
60-64.9	1.0
55-59.9	0.5

Expectations: It is expected that you come to class ready to participate and contribute to the discussion. The class will have discussions where there are no right or wrong answers – your opinion is important to contribute. The ideal student will contribute to discussions but will also let others participate.

Guidelines for Weekly Critiques:

Each student must write **ten** weekly critiques (3 points each). Students are not required to write a critique the week of their first presentation.

Each student will be **assigned one** of the scientific papers to **write a critique before** the start of class for each week we have oral presentations. The critique is expected to include **1)** scores indicating your assessments of the significance, innovation, and approach of the paper, **2)** an Overall Impact score, **3)** a paragraph summarizing the factors that informed your Overall Impact score, **4)** three questions, and **5)** bullet point critiques for each aspect of the paper (significance, innovation, and approach). The weekly critique should be typewritten using the **provided template (available on D2L)**.

Students are expected to lead the discussion of their assigned paper, but all students are encouraged to participate. Students should read all papers.

The weekly critique must be emailed to Dr. Crandall (cranda86@msu.edu) before the start of class (Wednesday at 12:40 p.m.).

The purposes of the reports are:

1. Learn to evaluate scientific work critically.
2. Have students come prepared for class.
3. To promote attention and facilitate participation in the discussion period.

Tips for writing weekly critiques (also see the ‘Writing effective critiques’ document on D2L):

1. Read the article and take notes.
2. General Guidance
 - i. Avoid general comments and provide specific details.
 - ii. Provide sufficient context to orient comments (e.g., does the comment refer to a specific experiment or figure?)
 - iii. Make sure bullets have evaluative statements that indicate your assessment of a particular aspect of the application.
 - iv. Make sure the text within each section is consistent with the score.
 - o Scores of 1-3 should be supported by clearly articulated strengths.
 - o Scores of 4-6 may have a balance of strengths and weaknesses.
 - o Scores of 7-9 should be supported by clearly articulated weaknesses (or lack of strengths).
 - v. Prioritize strengths and weaknesses by indicating if they are major or minor.
 - vi. Address all relevant critique sections (Significance, Innovation, and Approach)
 - vii. It is okay to state ‘None noted’ if you don’t feel there are any strengths or weaknesses for a specific section.
 - ii. Your overall impact paragraph should contain the following:
 - Introduce the general objective of the study in one sentence.
 - State the impact the paper will likely have and why.
 - Identify what the major score-driving factors were for you.
 - Explain how you balanced/combined/weighted the various criteria in the overall impact score.

Guidelines for Participation:

Students must come prepared for class. Participation is an expected and heavily weighted component of the student's grade. The student will receive points for participation by 1) coming prepared to class, 2) participating in the discussion, and 3) asking questions.

Guidelines for Oral Presentations:

Each student must give **two** formal presentations to the class on a research article.

The first oral presentation will be an individual presentation on a paper that Dr. Crandall will select. The presentation will be 20 minutes long, followed by a 5-minute discussion and question period. However, students not presenting will be encouraged to ask questions throughout the presentation. The student must assemble their presentation using PowerPoint (or a similar program). The presentation needs to include information and illustrations regarding the background and significance of the work, the methods/approaches used, the main figures/panels from the paper, and general conclusions.

The second oral presentation will be an individual presentation on a paper the student chooses. The paper should be on the same topic as the student's final written report. The talk should be 20 minutes long, followed by a 5-10 minute discussion and question period. Again, the presenter must assemble their presentation using PowerPoint (or a similar program) using appropriate diagrams and illustrations.

Since these are shorter presentations, the student needs to focus on being succinct. The focus should be briefly highlighting the article's significance and central findings. This could include all or just a subset of figures/figure panels.

The topic and paper of the second oral presentation must be submitted and approved by Dr. Crandall two weeks before the student's scheduled presentation.

Dr. Crandall will evaluate each oral presentation on the following:

1. Presentation preparation (quality and clarity of the slides shown)
2. Oral presentation (logic, clarity, delivery, and timing)
3. Completeness of coverage
4. The student's ability to answer questions

Tips for oral presentations:

1. Try to make the presentation interesting!
2. Remember, you are the expert. Therefore, you have no reason to be nervous.
3. Practice ahead to ensure you can finish in time.
4. Be prepared to answer questions during and at the end of the presentation.
5. Don't put too much text on your slides, and don't read from them!

Guidelines for the Final Written Report:

The student's final written report can focus on 1) normal inhibitory function in the forebrain, 2) how these inhibitory neurons have been implicated in neurological/psychiatric disorders, or 3) some combination of both. This report will be similar to a scientific review article in which students must use primary literature as their principal resource (not review articles).

The final written report should include the following:

1. Cover page (topic title, author's name, email, course number, date of submission)
2. Background
3. Hypothesis or central theme being addressed
4. Summary and critique of recent research findings. You may use subheadings.
5. Conclusion (this should be similar to a discussion section synthesizing the multiple studies referenced and the significance of your findings).
6. References (6 citations must be peer-reviewed research articles, 3 of which should be between 2020 and 2024).

Format. The report must be typewritten, include a cover page, and be 8-10 pages (not including the cover page) with double-spaced text using 1-inch margins and 12-point Arial font. Students are encouraged to include figures with legends to illustrate essential concepts or models, but they must be added to the end of the written report. Figures do not count toward the 8-10 pages. If figures are taken or adapted from another source, the student must reference the source in the legend. Students may also develop their own figures, models, graphs, or tables to summarize their findings.

References. Written reports must include a list of references. In addition, all students must have a minimum of 6 primary research articles in their report. Additional references, such as scientific reviews, editorials, books, or book chapters, can be used but will not count toward the 6 primary research articles. References should be numbered as they appear in the report using the following format:

For primary research articles, reviews, or editorials:

1. Crandall, S.R., Cruikshank, S.J., and Connors, B.W. (2015). A corticothalamic switch: controlling the thalamus with dynamic synapses. *Neuron* 86, 768-782.

For books and book chapters:

1. Usrey, W.M., and Sherman, S.M. (2022). *Exploring Thalamocortical Interactions: Circuitry for Sensation, Action, and Cognition*. New York, New York: Oxford University Press.
2. Sontheimer, H. and Olsen, M.L. (2007). Whole-cell patch-clamp recordings. In: Walz, W. editor, *Patch-Clamp Analysis: Advanced Techniques*, Second edition. Totowa, New Jersey: Humana Press, Pages 35-68.

When making a statement in your report, it should be cited by a number(s) at the end of the sentence indicating the particular reference. Do not quote a reference.

Citing in text:

Primary sensory areas in the cerebral cortex contain six neuronal layers (1). Anatomical and physiological data indicate that these layers are interconnected through vertical excitatory axons (2-4), suggesting that sensory processing in any given layer may be modulated by activity in several other layers.

1. Lorente de No, R. (1943). Architectonics and structure of the cerebral cortex. In: Fulton, J.F. editor, *Physiology of the Nervous System*. New York, New York, Oxford University Press, pages 274-301.
2. Douglas, R.J. and Martin, K.A. (2004) Neuronal circuits of the neocortex. *Annual Review of Neuroscience* 27, 419-451.
3. Lefort, S., Tómm, C., Floyd Sarria, J.C., and Petersen, C.C. (2009). The excitatory neuronal

network of the C2 barrel column in mouse primary somatosensory cortex. Neuron 61, 301-316.4.

4. Thomson, A.M., and Bannister, A.P. (2003). Interlaminar connections in the neocortex. Cerebral cortex 13, 5-14.

Due dates for Research Report:

- April 2: First draft of Written Report due
 April 27: Final Written Report due

Tips for final written report:

1. Search electronic databases (e.g., PubMed) to locate and read appropriate background material, recent reviews, and primary research papers.
2. After reading sufficient material, prepare an outline and start writing. You may use subheadings.
3. Remember to reference ideas that are not your own by citing the primary source,
4. **NEVER COPY** something verbatim from another text because this is PLAGIARISM and is NOT acceptable. In general, the scientific community does not quote other references. However, if word-for-word quotations are necessary to make a point, they should be used sparingly and always include the appropriate reference.

Class Calendar:

<u>Class</u>	<u>Instructor</u>	<u>Date</u>	<u>Topic</u>
1	Crandall	January 15	Lecture: Introduction, anatomy of a paper, and intro to the forebrain
2	Crandall	January 22	Lecture: Excitation/inhibition and Interneuron diversity
3	Crandall	January 29	Oral Presentations: Group 1
4	Crandall	February 5	Oral Presentations: Group 2
5	Vogt	February 12	Lecture: Interneuron development & neurodevelopmental disorders
6	Vogt	February 19	Oral Presentations: Group 3
7	Crandall	February 26	Oral Presentations: Group 4
-	-	March 5	No Class - Spring Break
8	Crandall	March 12	Oral Presentations: Group 5
9	Crandall	March 19	Oral Presentations: Group 1
10	Crandall	March 26	Oral Presentations: Group 2a
11	Crandall	April 2	Oral Presentations: Group 2b
12	Crandall	April 9	Oral Presentations: Group 3
13	Crandall	April 16	Oral Presentations: Group 4
14	Crandall	April 23	Oral Presentations: Group 5

Key Dates

- April 2 First draft of Written Report due
 April 27 Final Written Report due
 February 26 Group 1 – Individual Paper Selection Due
 March 12 Group 2 – Individual Paper Selection Due
 March 26 Group 3 – Individual Paper Selection Due
 April 2 Group 4 – Individual Paper Selection Due
 April 9 Group 5 – Individual Paper Selection Due

Attendance Policy:

PSL460 section 1 is an in-person course. Students are expected to attend and participate. Students must contact Dr. Crandall if they cannot attend class due to illness, bereavement, interviews, or other excusable reasons.

Grief Absences and Mental Health Policy:

If a student experiences the death of a family member or emotional distress from a similar tragedy, refer to MSU's Grief Absence Policy. If a student requires a grief absence, they must complete the Grief Absence Request form no later than one week after knowing the circumstance, and Dr. Crandall will work with the student to make appropriate accommodations. The form can be found at <https://reg.msu.edu/forms/formsmenu.aspx>.

College students often experience issues that may interfere with academic success, such as academic stress, sleep problems, juggling responsibilities, life events, relationship concerns, or feelings of anxiety, hopelessness, or depression. If you or a friend is struggling, we strongly encourage you to seek support. Helpful, effective resources are available on campus, and most are free.

- If you are struggling with this class, please check in during office hours or contact me by email at cranda86@msu.edu
- Check in with your academic advisor if you are struggling in multiple classes, unsure whether you are making the most of your time at MSU, or unsure what academic resources are available at MSU.
- Access CAPS Services for new counseling and psychiatric services by scheduling a consultation.
- CAPS is providing remote crisis services 24/7/365. Students can call us at 517-355-8270 and press "1" at the prompt to speak with a crisis counselor. Other prompt options are available for those not in crisis.
- Visit <https://caps.msu.edu/> for additional information and resources.

Accommodations for Students with Disabilities:

MSU is committed to providing equal opportunity for participation in all programs, services, and activities. Therefore, the student must arrange with the Resource Center for Persons with Disabilities (RCPD) Office at 517-884-RCPD or <https://www.rcpd.msu.edu/> to establish reasonable accommodations. The student will then need to provide Dr. Crandall with their verified individual services accommodation ("VISA") form issued by the RCPD to arrange accommodations.

Inclusion and Equity:

Michigan State University is committed to creating and maintaining an inclusive community where students, faculty, and staff can work together in an atmosphere free from discrimination. The Office of Institutional Equity (OIE) reviews concerns related to discrimination and harassment based on sex, gender, gender identity, race, national origin, religion, disability status, and any other protected categories under the [University Anti-Discrimination Policy](#) and [Policy on Relationship Violence and Sexual Misconduct](#). If you experience or witness acts of bias, discrimination, or harassment, please report these to OIE: <http://oie.msu.edu/>.

Mandatory Reporting Policy:

As a professor, one of my responsibilities is to help create a safe learning environment for my students and the campus. In addition, as a member of the university community, I am responsible for reporting any sexual harassment, sexual violence, or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence, or discrimination with a confidential employee who does not have this reporting responsibility, you can find a list of those individuals here: <https://centerforsurvivors.msu.edu/resources-and-coping/resources-and-coping-2/>.