PSYC 473 - NEUROBIOLOGY OF PSYCHIATRIC DISORDERS - Fall 2025

Instructor: Janet Menard
Office: Craine - 431
Phone: 533-3099
Email: menard@queensu.ca

Office Hours: Wednesdays, 3:30 – 4:30 (or by appointment)

GENERAL COURSE INFORMATION

Course: Psyc 473
Course title: Neurobiology of Psychiatric Disorders
Pre-requisites: PSYC 370. Recommended PSYC 205* or PSYC 305
Semester and year: Fall 2025
Number of credits: 3
Learning hours: 120 hrs
Modality: On campus
Classroom accessibility: - North (rear) entrance is accessible (ramp and powered door opener). Lecture hall is wheelchair accessible.

COURSE DESCRIPTION

An examination of current theories on the neurobiology of mental disorders (e.g. autism, schizophrenia, mood and anxiety disorders). Seminars will focus on the evaluation of animal models for investigating neurodevelopmental and pharmacological aspects of various psychopathologies.

COURSE MATERIALS

There is **no** required text for the course.

COURSE LEARNING OUTCOMES

To complete this course, students will demonstrate their ability to**:**
1. Describe the value and limitations of using animal models to study human psychopathology.
2. Discuss hypotheses about the neurobiology of psychiatric disorders at multiple levels of analysis (e.g., genetic, epigenetic, molecular, cellular, neural structure and neural system levels)
3. Locate relevant, current literature, and summarize and integrate complex ideas from a broad literature
4. Write effectively for different purposes (e.g., short report geared for the lay public; short critical report geared for the scientific community)
5. Design and deliver an effective oral presentation (PowerPoint/Prezi/KeyNote)
6. Effectively participate in group discussions and peer evaluations

ASSESSMENTS

Weighting and Alignment with Course Learning Outcomes (CLOs)

ASSESSMENT	COMPONENTS	WEIGHT	ALINGMENT WITH CLOS
PRESS RELEASE	Peer evaluation	5%	1, 2, 4
	Instructor Evaluation	20%	
ORAL PRESENTATION	Peer evaluation	5%	1, 2, 5, 6
	Instructor Evaluation	25%	
CLASS PARTICIPATION	• Participation in seminars • Peer evaluations • Reader (X 2)	10%	1, 2, 4, 6
JOURNAL CLUB ARTICLE	Due date – Dec 5 (midnight)	35%	1, 2, 3, 4, 6

TOPICS/ SCHEDULE

SECTION TOPIC – BACKGROUND LECTURES		
WEEK 1	Wednesday Sept. 3	Course objectives and structure
	Thursday Sept. 4	Background Lecture 1 – Animal models of psychopathology
WEEK 2	Monday Sept. 8	Background Lecture 2 – Signaling molecules, gene expression, epigenetics
	Wednesday Sept. 10	Background Lecture 3 – Signaling molecules, gene expression, epigenetics
	Thursday Sept. 11	Background Lecture 4 – Basic techniques in behavioural neuroscience
WEEK 3	Monday Sept. 15	Background Lecture 5 – Neuroscience methods - I
	Wednesday Sept 17	Background Lecture 6 – Neuroscience methods - II
		Background Lecture 7 – Neuroscience methods - III

SECTION TOPIC - STRESS, ANXIETY AND DEPRESSION			
WEEK 4	Monday, Sept. 22	Topic Lecture – Stress and Psychopathology	
STUDENT PRESENTATIONS			READERS
WEEK 4	Wednesday, Sept. 24	**Presenter – Samantha Tao** Zhang et al., (2025) Dopamine induces fear extinction by activating the reward-responding amygdala neurons. *PNAS (122)*18 e2501331122	**Noémie Guindon Riopel** **Samuel Gallo-Will**
	Thursday, Sept. 25	**Presenter – Nickalus Love** Dudek et al., (2020) Molecular adaptations of the blood–brain barrier promote stress resilience vs. depression. *PNAS, 117*, 3326–3336.	**Hunter Nicholls** **Bailey Hassard**
WEEK 5	Monday, Sept. 29	**Presenter – Ava Applejohn** Ma et al., (2021). Amygdala-hippocampal innervation modulates stress-induced depressive-like behaviours through AMPA receptors. *PNAS 118* (6) e2019409118.	**Isabelle Kosche** **Julia Fishman**
	Wednesday Oct. 1	**Presenter – Olivia Doyle** Xiong et al., (2025) Peripheral CD4+ T cells mediate the destructive effects of maternal separation on prefrontal myelination and cognitive functions. *PNAS 122(16) e2412995122.*	**Eliza Michelle Manuel** **Katie Wong**
	Thursday, Oct. 2	**Presenter – Agustina Tabares** Zhang et al., (2025) Distinct oxytocin signaling pathways synergistically mediate rescue-like behavior in mice. *PNAS 122*(17) e2423374122.	**Léa Francoeur** **Simran Sangha**

SECTION TOPIC - NEUROBIOLOGY OF SCHIZOPHRENIA			
WEEK 6	Monday, Oct. 6	Topic Lecture – Neurobiology of Schizophrenia	
		STUDENT PRESENTATIONS	**READERS**
WEEK 6	Wednesday, Oct. 8	**Presenter – Alicia Hartlieb** Yilmaz et al., (2021) Overexpression of schizophrenia susceptibility factor human complement C4A promotes excessive synaptic loss and behavioral changes in mice. *Nature Neuroscience* 24: 214–224.	**Mikayla Toplis** **Isabell Steele**
	Thursday, Oct.9	**Presenter – Otto Demark** Haddon et al., (2024) Linking haploinsufficiency of the autism- and schizophrenia associated gene Cyfip1 with striatal-limbic-cortical network dysfunction and cognitive inflexibility. *Translational Psychiatry 14:*256.	**Noémie Guindon Riopel** **Samuel Gallo-Will**
WEEK 7	Oct. 13-17	**FALL READING WEEK BREAK**	
WEEK 8	Monday Oct. 20	**Presenter – Léa Francoeur** Ma et al., (2023) Histamine H2 receptor deficit in glutamatergic neurons contributes to the pathogenesis of schizophrenia. *PNAS, 120* (9), 1-e2207003120.	**Hunter Nicholls** **Savannah Summers**
	Wednesday Oct. 22	**Presenter – Ella Stewart** Donegan et al., (2020). Coding of social novelty in the hippocampal CA2 region and its disruption and rescue in a 22q11.2 microdeletion mouse model. *Nature Neuroscience* 23:1365–1375.	**Shiksha Sagar** **Isabelle Kosche**
	Thursday Oct. 23	**Presenter - Simran Sangha** Romero-Miguel et al., (2024) N-acetylcysteine during critical neurodevelopmental periods prevents behavioral and neurochemical deficits in the Poly I:C rat model of schizophrenia. *Translational Psychiatry 14*:14.	**Eliza Michelle Manuel** **Olivia Doyle**
WEEK 9	Monday Oct 27	**Presenter – Reagan Armstrong** Tsivion-Visbord et al., (2020) Mesenchymal stem cells derived extracellular vesicles improve behavioral and biochemical deficits in a phencyclidine model of schizophrenia *Translational Psychiatry 10:*305.	**Agustina Tabares** **Ashley Massa**

SECTION TOPIC – NEURODEVELOPMENTAL DISORDERS			
WEEK 9	Wednesday Oct. 29	Topic Lecture – Neurobiology of Childhood Psychiatric Disorders	
STUDENT PRESENTATIONS			READERS
WEEK 9	Thursday Oct. 30	**Presenter – Savannah Summers** Yardeni et al., (2021) An mtDNA mutant mouse demonstrates that mitochondrial deficiency can result in autism endophenotypes *PNAS, 118* (6) e2021429118.	**Samantha Tao** **Nickalus Love**
WEEK 10	Monday Nov. 3	**Presenter – Mikayla Toplis** Zhou et al., (2022) Disruption of MeCP2-TCF20 complex underlies distinct neurodevelopmental disorders. *PNAS, 119 (4),* 1.	**Ava Applejohn** **Alicia Hartlieb**
	Wednesday Nov. 5	**Presenter – Isabell Steele** Ju et al., (2025) The "don't eat me" signal CD47 is associated with microglial phagocytosis defects and autism-like behaviors in 16p11.2 deletion mice. *PNAS 122(16) e2411080122.*	**Otto Demark** **Ella Stewart**
	Thursday Nov. 6	**Presenter – Katie Wong** Lapo Pais et al., (2025) Sex-specific cortical networks drive social behavior differences in an autism spectrum disorder model. *Translational Psychiatry 15:*251.	**Simran Sangha** **Bailey Hassard**
WEEK 11	Monday Nov. 10	**Presenter – Julia Fishman** Wang et al., (2021) Impaired calcium signaling in astrocytes modulates autism spectrum disorder-like behaviors in mice. *Nature Communications 12:*3321**.**	**Léa Francoeur** **Reagan Armstrong**
	Wednesday Nov. 12	**Presenter – Ashley Massa** Allen et al., (2022) Astrocytes derived from ASD individuals alter behavior and destabilize neuronal activity through aberrant Ca2+ signaling. *Molecular Psychiatry 27:*2470 – 2484.	**Agustina Tabares** **Shiksha Sagar**

SECTION TOPIC - NEUROBIOLOGY OF SUBSTANCE USE DISORDER			
WEEK 11	Thursday Nov. 13	LECTURE: Neurobiology of substance use disorder.	
STUDENT PRESENTATIONS			**READERS**
WEEK 12	Monday Nov. 17	**Presenter – Noémie Guindon Riopel** Duan et al., (2022) Compulsive drug-taking is associated with habenula–frontal cortex connectivity. *PNAS, 119* (50), e2208867119	**Samantha Tao** **Nickalus Love**
	Wednesday Nov.19	**Presenter – Samuel Gallo-Will** Kallupia et al., (2020) Nociceptin attenuates the escalation of oxycodone self-administration by normalizing CeA–GABA transmission in highly addicted rats. *PNAS, 117* (4) 2140–2148.	**Ava Applejohn** **Olivia Doyle**
	Thursday Nov. 20	**Presenter – Hunter Nicholls** Zhou et al., (2023) Single-nucleus genomics in outbred rats with divergent cocaine addiction-like behaviors reveals changes in amygdala GABAergic inhibition. *Nature Neuroscience* 26:|1868–1879.	**Alicia Hartlieb** **Otto Demark**
WEEK 13	Monday Nov. 24	**Presenter – Bailey Hassard** Degoulet et al., (2021) Subthalamic low-frequency oscillations predict vulnerability to cocaine addiction. *PNAS, 118* (14) e2024121118.	**Savannah Summers** **Mikayla Toplis**
	Wednesday, Nov 26	**Presenter – Shiksha Sagar** Venniro et al., (2020) Abstinence-dependent dissociable central amygdala microcircuits control drug craving. PNAS, 117 (14), 8126-8134.	**Reagan Armstrong** **Katie Wong**
	Thursday Nov.27	**Presenter – Isabelle Kosche** Werner et al., (2020) Neuroadaptations in the dorsal hippocampus underlie cocaine seeking during prolonged abstinence. *PNAS, 117* (42) 26460–26469.	**Isabell Steele** **Ella Stewart**
Week 14	Monday Dec 1	**Presenter – Eliza Michelle Manuel** Estave et al., (2024) Co-targeting the kappa opioid receptor and dopamine transporter reduces motivation to self-administer cocaine and partially reverses dopamine system dysregulation. *Scientific Reports 14:6509.*	**Julia Fishman** **Ashley Massa**

DESCRIPTIONS OF LEARNING ACTIVITIES AND ASSESSMENTS

Press Release

You will be assigned a paper published in a high impact journal. Your job is to craft a media-style press release, summarizing the paper for a non-expert audience. Your press release should capture the key findings and the primary take-home messages in a manner that an intelligent non-expert can comprehend.

Source Material
- Your press release will be based on the same paper you are assigned for your oral presentation. Presentation dates and papers are listed under the "Student Presentations" sections of the course schedule.

Guidelines
- **Length:** The press release should be no longer than two pages.
- **Language:** Use lay language tailored for a non-specialist audience.
- **Content:** Focus on the paper's key findings. While creativity is encouraged, grading will be primarily based on content.

Submission Details
- **Due Date: At least 3 DAYS BEFORE your scheduled oral presentation at OnQ**
- **Format:** upload as both .pdf and .docx files.
- **File Naming:** YourLastName_PressRelease.FileType (e.g., Smith_PressRelease.docx AND Smith_PressRelease.pdf).

Utilizing AI
You must write the initial drafts of your Press Release on your own. Once your final draft is finished you have the option of using AI (e.g., ChatGPT) to polish it. **If you take advantage of this option, you need to submit an additional file detailing your interaction(s) with the AI.** This should list any questions, prompts, and information (i.e., your draft document) that you fed into the AI, as well as the AI's responses. For example, if you ask ChatGPT to "revise the clarity and flow of the following news article:…", your supplementary file will need to contain both that prompt, the text of your final draft and ChatGPT's output.
- **File Naming for AI Interaction:** yourlastname_PressRelease_AI.docx (e.g., Smith_PressReleaseAI.docx).
- **Authorship:** Acknowledge your used of AI on the facing page of the final version of your Press Release – at the author line, state your name along with the AI programs you used (e.g., Alex Smith, in collaboration with ChatGPT).
- **Tip: Using AI should be an iterative process**. Check the AI 'revisions' carefully to make sure that the AI has not changed the meaning of your content. You might choose to edit some parts of the AI revisions, add in additional details, and/or limit the use of adjectives (ChatGPT is overly fond of adjectives – sometimes that works but sometimes using fewer adjectives is more impactful).

Postings
The final version of your press release, along with the supplementary AI file (if applicable) will be made accessible to the class, at onQ, 2 days prior to your presentation date.
Objective: The intention behind posting the press release is to set the stage for your oral presentation, providing a concise overview for your peers. Moreover, by sharing AI interactions transparently, we aim to familiarize the class with AI in a responsible and upfront manner.

Oral Presentation

You will each prepare a comprehensive, oral presentation show-casing your assigned paper. These are challenging papers. Don't worry if it takes you several reads (and searches in Google) before you understand them. Once you have 'decoded' your assigned paper, your job is to bring the class to the same level of understanding via a 25-30 min oral presentation. Gear your presentation for a mixed audience of senior undergrads with varying levels of background in behavioural neuroscience.

Guidelines
- **Duration:** 25-30 min oral presentation, followed by a 10-15 min question/discussion period

- **Software:** Use a presentation software program of your choice, such as PowerPoint, Prezi, or KeyNote.
- **Content:** The paper might include several experiments – you don't need to (and probably shouldn't) cover them all. Choose the most relevant key findings to develop a well-rounded presentation that should include:
  - Relevant background information
  - Specific objectives of the study
  - Methods (describe behavioral methods in enough detail for the class to grasp what was done; molecular methods can be brief enough to capture end result (e.g., mice were engineered to express fewer 5-HT2 receptors)
  - Study results
  - Relevance of the article to our understanding of psychopathology
- **Assistance:** If you find any part of your paper challenging, don't hesitate to approach me. We can decipher it together.
- **Submission Details:**
  - **Due Date: Upload your presentation slide-deck at OnQ on the day of your presentation (preferably prior to class)**
  - **File Naming:** YourLastName_Presentation.filetype (e.g., Smith_Presentation.pptx).

Class Participation

Evaluation of Student Press Releases and Oral Presentations:
- **Attendance at seminars is mandatory.**
- **Evaluations:** An evaluation form is available at onQ. The same form will be used to evaluate both press releases and oral presentations.
- **Format:** Please read and provide a concise, informal critique of each press release (PR), prior to the relevant class. Your evaluation of press releases should be around 150-200 words (free form), highlighting your key impressions. Consider aspects like layout, organization, clarity for lay audiences, strengths, weaknesses and whether the press release prepared you for the presentation. Complete your evaluation of the presentations during class (or shortly after). Give the kind of critical feedback that you yourself would find helpful – highlight what worked and what didn't, and what could be done to make it better.
- **Submission Details:**
  - **Due Date: upload your evaluations to OnQ within 48hrs of the relevant presentation.**
  - **File Naming:** *YourLastName_PresenterLastName_Evaluation.docx (e.g., Smith_Brown_Evaluation.docx).* Remember to **put your last name first** in the file name to help me with tracking your submissions.

Role of the Reader:
- **Duty:** Each student will be a designated reader for two oral presentations.
- **Task:** Familiarize yourself with the paper being presented and prepare 4-5 questions to ask post-presentation. There's no need to send these questions in advance. Having them written down aids your participation in class. you in class).

Journal Club Article

This assignment gives you the opportunity to write a brief, scientific communication for an expert audience. You will select and review a topical empirical paper of your choice. The article may be the same paper you used for your oral presentation, another paper covered in class, or a relevant paper not discussed in class.

Source Material
- Must focus on the brain and psychopathology (clinical/human, preclinical/animal, or both)
- Must have been published within the last 5 years (since 2020)

- Must come from a high impact journal (e.g., *Science*, *Nature*, *Nature Neuroscience*, *PNAS, Translational Psychiatry, Molecular Psychiatry*)
- If you select a paper not covered in class, clear it with me before starting

Guidelines
- Maximum 1500 words (excluding references)
- Times New Roman, 11-pt font, single-spaced
- Include title and your name in a header at the top of the first page (no separate title page)
- Section headers encouraged but not required
- Use a numbered referencing system, adopt any style but be consistent
- **At least 10 of your references <u>must not</u> come from the original article's reference list**

Content
  Your review must do more than just summarize the original article. It should include the following elements:
- Brief description of the topic and research question(s)
- Concise description of methods sufficient for context (e.g., "rats were tested in the elevated plus-maze, widely used to study anxiety in rodents")
- Summary of key findings
- **Critical evaluation of the findings supported by literature** (e.g., Did the original authors adequately address potential limitations? How well do the findings fit with other reports on the same topic? Are they supported or contradicted by other reports in the literature? How do the findings advance our understanding of psychopathology? Where should the research go next? These are just general guidelines to get you started (and might not apply to all papers). You might approach your critique in a completely different way, but whatever direction you take it in, you must support your arguments by citing relevant literature.

Evaluation
- Graded on content, readability, organization, grammar, referencing, and adherence to guidelines
- Concise, precise prose expected (you are writing for experts—avoid over-explaining basic concepts)

Utilizing AI
- You have the *option* of utilizing AI to "polish" your Journal Club Article.
- Same restrictions as for the Press Release (i.e., you must write the first draft, acknowledge your use of AI next to your name in the author line and submit an additional file detailing your interactions with the AI).

Submission Details
- **Due Date: December 2, by midnight (1% deduction for each day late)**
- Upload to OnQ as: YourLastName_ JournalClub.docx

Marking Scheme

Psych 473 will utilize a "Numbers In, Letters Out" marking scheme: The final grade you receive for the course will be derived by converting your numerical course average to a letter grade, according to Queen's Official Grade Conversion Scale.

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

QUEEN'S POLICY STATEMENT ON ACADEMIC INTEGRITY

The following statement on academic integrity builds on a definition approved by Senate and is designed to make students aware of the importance of the concept and the potential consequences of departing from the core values of academic integrity. It is highly recommended that this statement be included on all course syllabi. Instructors may also consider including this statement with each assignment.

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1), on the Arts and Science website (see http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity), and from the instructor of this course.

Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

TURNITIN STATEMENT

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarism.
Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. Turnitin compares submitted files against its extensive database of content, and produces a similarity report and a similarity score for each assignment. A similarity score is the percentage of a document that is similar to content held within the database. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.
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LAND ACKNOWLEDGEMENT

Queen's University occupies traditional Anishinaabe and Haudenosaunee territory. To acknowledge this traditional territory is to recognize its longer history, one predating the establishment of the earliest European colonies. It is also to acknowledge this territory's significance for the Indigenous Peoples who lived, and continue to live, upon it and whose practices and spiritualties are tied to the land and continue to develop in relationship to the territory and its other inhabitants today. Indigenous communities in Kingston/Katarokwi continue to reflect the area's Anishinaabe and Haudenosaunee roots. There is also a significant Métis community and First Peoples from other Nations across Turtle Island present here today. To read more about the history of the land, see the Queen's Encyclopedia and to learn more about land acknowledgements, see the Office of Indigenous Initiatives.