**PSY 410A: ADDICTION NEUROSCIENCE**

**Wednesdays and Fridays, 8:30am-9:50am  
Psychology, Room 227**

**Instructor:**Matthew McMurray, PhD  
**Office:**Psychology Building, Rm 221  
**Office Hours:** Thursday 3-5pm **Email:**[matthew.mcmurray@miamioh.edu](mailto:matthew.mcmurray@miamioh.edu)

## **COURSE OVERVIEW**

Addiction is a chronic, relapsing psychiatric disorder defined by compulsive drug seeking despite the tremendous negative consequences. In this course, we will investigate the neurobiological systems altered by drug abuse, how these are altered during the transition from casual abuse to addiction, and discuss current treatments for addiction and their mechanisms of action. This course will have a strong focus on the molecular mechanisms of drugs of abuse and addiction, with a heavy emphasis on animal models of addiction.

## **LEARNING OBJECTIVES**

1. Understand the essential neural and biological systems involved in the development of addictions, and how these systems change with continued drug use.
   * Methods of evaluation: Class participation; presentation; research proposal
2. Critically analyze theoretical and empirical articles on the behaviors, neurobiology, and treatment of addictions.
   * Methods of evaluation: Class participation; discussion entries; in class presentations; research proposal
3. Provide and respond to feedback constructively as part of a scientific team.
   * Methods of evaluation: research proposal; peer review

## **COURSE REQUIREMENTS**

### Readings

There is no book associated with the course. All required readings & media are available via Canvas. You are responsible for completing each reading by the beginning of class on the date the reading is assigned and bringing a digital or printed (preferred) copy of the reading to each class.

### Participation & Attendance (100pts total)

Class participation is critical for this course and includes attendance, discussion, active listening, and providing feedback to peers. At the beginning of Week 5, students will complete mid-semester self-evaluations rating students’ progress on class participation (non-graded). Additionally, the instructor will provide evaluations of each student’s participation. Although it will not impact my ratings, I encourage students to discuss major discrepancies between self-perceptions and instructor ratings during office hours. At the end of the semester I will update my mid-semester participation ratings to a final participation rating using the same ratings form. Students have the option of completing updated self-evaluations to rate his or her final self-perceived class participation.

### Discussion Entries (100pts total, 5 points each)

When noted on the class schedule, a brief discussion entry (a few sentences only, maximum length: 1-2 paragraphs) should be posted on Canvas by 9pm the night before each class. Discussion entries are intended to evaluate your critical thinking about course topics and to generate possible items for class discussion. Entries can take the form of 1) ideas thoughtfully building upon the associated reading; 2) substantive critiques of the assigned material; 3) genuine questions you have that logically follow from the ideas you encountered in the material. In each case, the entry should demonstrate evidence of understanding and thoughtful engagement with the material, and should provide evidence supporting its main point. For instance, questioning the generalizability of a study that uses only a single rodent strain would not be sufficient to receive full credit; this critique could be repeated for many studies and would not show depth of thinking about that particular study. Statements about why the sampling strategy might be an important limitation for the research question under scrutiny would better support the point. Similarly, descriptions of personal reactions to the content (e.g., “I thought the finding was interesting”) without further explanation do not provide sufficient evidence of deeper, critical engagement with the material. The group presenting the paper (presentations detailed below) is not required to submit discussion entries.

### In Class Presentations (400pts total)

Groups of 3-4 students will present each assigned reading and lead its discussion in class. Presentations should detail the background, research question, hypothesis, methods, results, conclusions, and answer complex questions about the material from both the instructor and the other students. Given the complexity of neuroscience research methods, groups are encouraged to provide background materials on complex methods or concepts within their presentation. For example, if a manuscript relies on western blots, groups should explain what a western blot is and roughly how it works. This will often require additional reading. If methods are unclear and cannot be deciphered through additional readings, please seek the assistance of the instructor. Additionally, each group is should incorporate at least 3 discussion points raised by their classmates on Canvas, giving proper credit to the author of the discussion entry. These will help facilitate discussion of the manuscript in a wider context. Since these are group presentations, each member of the group is expected to participate in the presentation, and each member of the group will be graded based on his or her own performance, as well as the group’s. In addition to the instructor’s grade of the group’s presentation, halfway through the semester and again at the end of the semester, each member of the group will grade the other group members. Only the grade at the end of the semester will count towards your final grade.

**Individual Points:** 200 total (50 points each)  
**Group Points:** 200 total (50 points each)

### Research Project (310pts total)

Students will engage in a scaffolded writing assignment, resulting in a combined literature review and novel research question related to addiction. This assignment will be broken into parts conducted both inside and out of class throughout the semester:

1. **Initial Research Question (5 points): Each student will submit on Canvas a 2-3 sentence description of his or her research interest. If multiple interests exist, students are allowed to submit up to three. The topic(s) submitted will be used to guide the initial literature search process, but students will not be expected to maintain this exact topic throughout the semester. If the literature or our in-class discussions suggest an alternate direction may be more appropriate, students should pursue that direction instead.**
2. **Annotated Bibliography (10 points): For 10 student-chosen articles related to your research topic, you will provide a 1-paragraph description of the article that includes the purpose/hypothesis, brief description of the approach (methods), brief description of the results and a statement about why you believe it is an important article. The articles selected should be original research articles (not review articles).** This assignment will be graded purely on completeness (1pts for each article), although the instructor will suggest additional readings where appropriate.
3. **Draft Specific Aims Page (10 points):** Each student will submit on Canvas a one page summary of his or her research proposal, describing the basis for the research aims, how they will be addressed, and their hypotheses. More details on this will be given in class. This draft will be scored purely on completeness (0 = not submitted; 5 = incomplete submission; 10 = complete submission).
4. **Draft Research Strategy (10 points):** Each student will complete a draft of their Research Strategy by the deadline indicated on the course calendar. This draft should be at least 6 pages in length, and will be scored purely on completeness (0 = not submitted; 5 = incomplete submission; 10 = complete submission). More details will be discussed in class.
5. **Peer Review Editing (50 points): In class we will be completing peer-reviews of group member draft proposals (Specific Aims and Research Strategy). Thus, not only will each student’s draft be graded as described above, but your critical review of your other group member’s work will also be graded, based on thoroughness, thoughtfulness, and productive (cordial) critique.**
6. **Final Paper Points (200 points):** The final paper will include 1 page for Specific Aims, 6 pages for Research Strategy (not counting a bibliography), and a 1 page “Response to Reviewers”, in which students explain how they adapted their proposal based on peer-review feedback. Each point raised by peers must be addressed or explained why it was not addressed. Details on this paper will be discussed throughout the semester.
7. **Final Peer Review of Paper (15 points): During finals week, we will conduct a mock grant review panel, in which final reviewer scores will be assigned to each student’s paper. Each student’s proposal will be read and scored by 3 non-group members, briefly presented to the class by the readers during final’s week, and a final score awarded by the class. The score assigned to each proposal will be used to calculate the number of points your proposal receives from this category.**

## **GRADING**

The final grade will be calculated as the number of points earned divided by the total number of points available (900), and assigned a letter grade as follows:

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| --- | --- | --- | --- |
| **Total %        Grade**100%              A+ 93 – 99%         A 90 – 92%         A- | **Total %        Grade**87 – 89%         B+ 83 – 86%         B 80 – 82%         B- | **Total %        Grade**77 – 79%         C+ 73 – 76%         C 70 – 72%         C- | **Total %        Grade** 67 – 69%         D+ 63 – 66%         D 60 – 62%         D- <59%               F |

## **COURSE POLICIES**

### Late Assignment Policy

An assignment is considered late if it is not turned in before the due date/time. **No late Discussion Entries will be accepted**. If an assignment is going to be late (other than a Discussion Entry), I encourage you to contact me in advance. However, all late assignments are penalized and NO assignment will be accepted more than 72 hours after its original due date:

* You will lose 10% from the total possible score if it is turned in within 24 hours after the due date
* You will lose 20% from the total possible score if it is turned in between 24 and 48 hours late
* You will lose 30% from the total possible score if it is turned in between 48 and 72 hours late

NOTE: In all cases, if you/your paper/your assignment/etc is going to be late, please make arrangements with me in advance. It is up to you to make these arrangements; I will not track you down if your assignment is missing.

## Academic Honesty

Academic Integrity is at the heart of the mission and values of Miami University and is an expectation of all students. As the [Code of Love and Honor](http://www.miamioh.edu/iammiami) states, “I stand for honesty, integrity, and the importance of moral conduct.” This is an expectation for all Miami community members. Maintaining academic integrity is a reflection of your character and a means to ensuring that you are achieving the outcomes of this course and that your grades accurately reflect your learning and understanding of the course material.

Both Miami University and the Psychology department are dedicated to providing a learning environment based not only upon academic excellence, but academic integrity as well. In this course it is expected that you will adhere to all Miami University guidelines regarding academic misconduct. For more information about academic integrity, please review the [Academic Integrity Information Guide](http://miamioh.edu/integrity/student-resources/) and the [Policy](http://blogs.miamioh.edu/miamipolicies/?p=1994).

Academic dishonesty is defined as any activity that compromises the academic integrity of the institution or subverts the educational process. Examples of academic dishonesty include, but are not limited to:

1. Cheating: using or attempting to use or possessing any aid, information, resources, or means in the completion of an academic assignment that are not explicitly permitted by the instructor or providing such assistance to another student.
2. Plagiarism: presenting as one’s own work ideas, representations, or words of another person/source without proper attribution.
3. Fabrication: falsification, invention, or manipulation of any information, citation, data, or method.
4. Unauthorized collaboration: working with another individual or individuals in any phase of or in the completion of an individual academic assignment without explicit permission from the instructor to complete the work in such a manner.
5. Misrepresentation: falsely representing oneself or one’s efforts or abilities in an academic assignment.
6. Gaining an unfair advantage: completing an academic assignment through use of information or means not available to other students or engaging in any activity that interferes with another student’s ability to complete his or her academic work.

Attempts to engage in any of the above actions will be treated the same as completed acts. Any suspected instances of academic dishonesty will be handled under Miami University’s Academic Integrity policy found in [Part 1, Chapter 5 of the Student Handbook](http://blogs.miamioh.edu/miamipolicies/?p=1994). Please review this policy, and note that lack of knowledge or understanding of the appropriate academic conduct is not an excuse for committing academic dishonesty. Students who are found responsible for committing academic dishonesty will receive a sanction that ranges from a zero on the assignment to an F in the course, which could also include the AD transcript notation. Students who commit academic dishonesty twice will automatically be suspended from Miami. If you have questions about how to complete an assignment or what could constitute academic dishonesty for a particular assignment, please feel free to visit me during office hours. I also encourage you to meet with me if you suspect that another student in the course has engaged in academic misconduct.

## Communication

Email is an important form of professional communication. I expect that you will check your email daily for any updates about the course. I will do my best to respond to emails by the end of the next business day. Some questions may be complicated, thus I may ask you to make an appointment or ask the question in class in order to ensure that I am able to answer it clearly. I also expect that you will follow professional standards in your email (calling me Dr. or Professor McMurray, saying please and thank you, and checking Canvas and the syllabus BEFORE emailing with a question). These guidelines also apply to your review of your peers’ work. Please be respectful and courteous, and restrict your review to productive critique. Points will be taken away for combative or unproductive language.

## Electronic Devices & Classroom Courtesy

Please be respectful of your instructor and your peers during class. Enter and exit quietly if you come in late or have to leave early for an emergency. Turn off your phone for the entirety of class. Students are encouraged to bring laptops/tablets to class, as these can be very helpful in generating discussion or quickly looking up information. However, all sound should be turned off (unless needed for class) and use for non-class related activities will be noted in participation reviews.

In-class presentations should be taken seriously. This is your opportunity to demonstrate your knowledge of the material, as well as your ability to think critically and share your ideas with a broader community. Please dress appropriately.

## Accommodations

If you have a condition or disability that requires accommodation, please register with Student Disabilities Services at (513) 529-1541. This office will coordinate arrangements. For assistance with specific learning disabilities, ADHD, or general tutoring, contact the Rinella Learning Center at (513) 529-8741. Guidelines for who is eligible for services and accommodations can be found at <http://www.miamioh.edu/student-life/sds/> and [www.miamioh.edu/student-life/rinella-learning-center/index.html](http://www.miamioh.edu/student-life/rinella-learning-center/index.html).

## **Course Schedule/Reading Assignments**

I reserve the right to change the syllabus as is necessary. Additional readings and/or activities may be added.

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| --- | --- | --- | --- | --- |
| **Week** | | **Date** | **Topic** | **Reading Due Before Class** |
| **Introduction and Review** | 1 | Jan 27 | Introduction and overview of addiction | None |
|  | Jan 29 | Synaptic physiology review session | None |
| 2 | Feb 3 | Psychopharmacology review session | None |
|  | Feb 5 | What is a scientific paper, how do you read one, and how do you present one? | None |
| 3 | Feb 10 | What are animal models and why do we use them?  Developing a research topic | Nestler & Hyman 2010 |
|  | Feb 12 | Library instruction session | None |
| 4 | Feb 17 | Research grant proposals and review  **Research Topic Ideas due by class start** | Sample NIH Grant |
|  | Feb 19 | The mesolimbic dopamine system\* | Day et al 2007 |
| **The Spiral to Addiction** | 5 | Feb 24 | Drugs and dopamine (Part 1)\* | Phillips et al 2003  Cheer et al 2007 |
|  | Feb 26 | Drugs and dopamine (Part 2)\*  **Annotated Bibliography due by 9PM** | Daberkow et al 2013 |
| 6 | Mar 2 | The genetics of addiction (Part 1)\* | Rhodes et al 2007 |
|  | Mar 4 | The genetics of addiction (Part 2)\* | Zhang et al 2015 |
| 7 | Mar 9 | Dose, timing, and duration of drug use (Part 1)\* | Wee et al 2007 |
|  | Mar 11 | Dose, timing, and duration of drug use (Part 2)\* | Rodd-Henricks et al 2006 |
| 8 | Mar 16 | Age of first use (Part 1)\* | Ye et al 2014 |
|  | Mar 18 | Age of first use (Part 2)\*  **Draft of Specific Aims page due by midnight** | Wong et al 2013 |
| 9 | Mar 23 | NO CLASS: Spring Break | None |
|  | Mar 25 | NO CLASS: Spring Break | None |
| **The Cycle of Addiction** | 10 | Mar 30 | Tolerance\* | Calipari et al 2014 Broadwater et al 2011 |
|  | Apr 1 | In-class writing day  **Draft of Significance Section due by midnight** | None |
| 11 | Apr 6 | Sensitization\* | Vezina et al 2002 |
|  | Apr 8 | Withdrawal\*  **Draft of Innovation Section due by midnight** | Kaufling & Aston-Jones 2015 |
| 12 | Apr 13 | Craving\* | Li et al 2015 |
|  | Apr 15 | Relapse (Part 1)\*  **Draft of Approach Section due by midnight** | Wang et al 2005 |
| 13 | Apr 20 | Peer review of draft papers | None |
|  | Apr 22 | Relapse (Part 2)\* | Lasseter et al 2013 |
| **Addiction Treatment** | 14 | Apr 27 | Comorbidities\* | Cohen et al 2014 |
|  | Apr 29 | Pharmacotherapies for addiction\* | Hall et al 2015  Anton et al 2008 |
| 15 | May 4 | The neurobiology of abstinence\* | Hollander & Carelli 2005 |
|  | May 6 | Non-drug addictions\* **Final Papers due by 9PM** | Johnson & Kenny 2010 |
|  | 16 | May 13 | 8:00am - Mock Study Section Proposal Review | Other student proposals |

\* Discussion Entries due by 9PM of the preceding day