**NEUR 651: MOLECULAR NEUROPHARMACOLOGY**

**(BIOL691/PSYC592)**

**Fall 2016; W 12-2:45; Krasnow ROOM 229**

**INSTRUCTOR:** Nadine Kabbani, Ph.D.
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Office Hours: W, 3–5:00 pm or by appointment

**Overview**: This is a core graduate neuroscience course that covers key concepts in cellular and molecular neuropharmacology. It emphasizes topics such as receptor signaling, mechanisms that drive cell structure and membrane function, modulation of electrical and synaptic neuron properties, and molecular mechanisms of brain disease and treatment. The course also explores trends in neuropharmacology research and preclinical drug development. Attendance and participation is required.

**Textbook**: **Molecular Neuropharmacology**: A Foundation for Clinical Neuroscience (Second Edition). Eric Nestler, Steven Hyman, Robert Malenka

**Class structure and grading:** The class will be divided into 2 parts: A lecture followed by a presentation and discussion on a primary research article in a journal club like fashion. There will be 2 exams and each is worth 40% of the final grade. The remaining 20% is based on an presentation using the following grading rubric:

| Criteria | Strong (10) | Average (8) | Below average (6) |
|---|---|---|---|
| Content (10pt max.) | Topic was discussed thoroughly and sufficient information provided. | Topic was discussed well. One or more issues were not entirely clear. | Discussion of the topic enabled a broad understanding leaving a number of unanswered questions. |
| Delivery/Organization (10pt max.) | Well prepared. Slides were clear. The presenter answered all questions. | Minor aspects of the presentation (visual or verbal) were not clear. | Presentation lacked clarity |

**HONOR CODE**: You must follow the guidelines of the GMU Honor Code as described in the GMU catalog.

**Disabilities:** If you are a student with a disability and you need academic accommodations, please see me privately and contact the Office of Disability Resources at 703-993-2474.

**Inclement Weather**: On bad-weather days, consult the University's homepage for cancellation information.

**Course Schedule**

| Lecture | Date | Lecture Title | Chapter |
|---|---|---|---|
| 1 | 8/31 | Fundamentals of Neuropharmacology | Ch. 1 |
| 2 | 9/7 | Cellular Basis of Communication | Ch. 2 |
| 3 | 9/14 | Synaptic Transmission | Ch.3 |
| 4 | 9/21 | Signal Transduction in the Brain | Ch.4 |
| 5 | 9/28 | Excitatory and Inhibitory Amino Acids | Ch. 5 |
| 6 | 10/5 | Widely Projecting Systems: Monoamines and Acetylcholine, Neuropeptides | Ch. 6,7 |
| | **10/12** | **No class Yom Kippur** | |
| | **10/19** | **Exam 1** | **Ch. 1-7** |
| 7 | 10/26 | Neural and neuroendocrine control of the internal milieu | Ch. 10 |
| 8 | 11/2 | Higher cognitive function and behavioral control | Ch. 13 |
| 9 | 11/9 | Mood and emotion | Ch. 14 |
| | **11/16** | **No class SFN Meeting** | |
| 10 | 11/23 | Reinforcement and addictive disorders | Ch. 15 |
| 11 | 11/30 | Schizophrenia and other psychoses | Ch. 16 |
| 12 | 12/7 | Neurodegeneration | Ch. 17 |
| | **12/** | **Final Exam** | **Ch. 10-17** |

**Presentation Articles**

| Lecture | Article | Presenter |
|---|---|---|
| 1 | Exp Neurol. 2009 Sep;219(1):112-25. Local calcium-dependent mechanisms determine whether a cut axonal end assembles a retarded endbulb or competent growth cone. Kamber et al. | Kabbani |
| 2 | Trends Neurosci. 2014 Aug;37(8):424-32. Calcium signaling in axon guidance. Sutherland et al. | Bobde |
| 3 | Trends Neurosci. 2015 Aug;38(8):496-505. The cellular and molecular landscape of neuroligins. Bemben et al. | Lee |
| 4 | Curr Neurol Neurosci Rep. 2016 May;16(5):44. Mapping the Connectome Following Traumatic Brain Injury. Hannawi et al. | Bayne |
| 5 | Front Cell Neurosci. 2015 Sep 24;9:371. Development and regulation of chloride homeostasis in the central nervous system. Watanabe et al. | Smith |
| 6 | Nat Rev Drug Discov. 2014 Sep;13(9):692-708. Opportunities and challenges in the discovery of allosteric modulators of GPCRs for treating CNS disorders. Conn et al. | Attili |
| 7a | J Mol Endocrinol. 2013 Dec 19;52. cAMP in the pituitary: an old messenger for multiple signals. Peverelli et al. | Booth |
| 7b | Neuropharmacology. 2016 Jul 5. Kynurenine pathway metabolism and the microbiota-gut-brain axis. Kennedy et al. | Purwin |
| 8a | Neuron. 2016 Jan 20;89(2):248-68. The Cellular and Molecular Landscapes of the Developing Human Central Nervous System. Silbereis et al. | Cho |
| 8b | Cold Spring Harb Perspect Biol. 2016 Apr 1;8(4). The Role of Functional Prion-Like Proteins in the Persistence of Memory. Si et al. | Shaw |
| 9 | Front Cell Neurosci. 2016 Feb 15;10:32. SYNGAP1: Mind the Gap. Jeyabalan et al. | Ko |
| 10 | Ann N Y Acad Sci. 2014 Oct;1327:27-45. Diverse strategies targeting α7 homomeric and α6β2* heteromeric nicotinic acetylcholine receptors for smoking cessation. Brunzell et al. | Greer |

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|---|---|---|
| 11 | Nat Rev Neurosci. 2015 Jan;16(1):30-42. Endocannabinoid signalling and the deteriorating brain. Di Marzo et al. | Lewitus |
| 12 | Cytoskeleton 2016 Feb 13. Actin dynamics and cofilin-actin rods in Alzheimer disease. Bamburg et al. | Pinto |

**Guidelines on presentation-**

The article presentation portion of the course is intended to help the student gain insight into the current literature on key topics and trends in the fields of neuroscience and neuropharmacology. Many of these articles are related to topics discussed during the lecture portion of the course. In assigning each of you an article to present, you will also have a chance to learn from each other. My expectation is that each presentation will contain sufficient background information to enable everyone to follow the details of the review article. In many cases this will require that the presenter delve into the background literature and obtain figures, information, or images from sources outside of the article. Moreover, it is my expectation that we as a class can discuss the article during the presentation and this requires that we have all read it prior to class. **Key guidelines:**

1. A computer with Internet access will be available in Krasnow room 229 so bring your complete presentation on a flash drive or access it via Mason log in the day of the presentation.
2. Each presentation should last no less than 45 min.
3. Try to foster interaction and participation during your presentation by presenting important thought questions at the beginning or throughout presentation.
4. A series of online visual aids including videos maybe useful during your presentation.