- Course Information -

University:	University of Nebraska at Omaha
College:	Arts and Sciences
Curriculum:	Neuroscience
Number:	4900
Type:	Lecture and Lab
Title:	Special Topics in Neuroscience
Short title:	Topics in Neuroscience
Effective term:	Fall 2015
Graduate non-degree students:	Not allowed
Can course be taken for credit multiple times?	Yes
Number of total hours:	9

- Credit Hours Information -

Type:	Variable
Hours:	1 (minimum)
	3 (maximum)

- Cross-listing and/or Dual-listing (UG/G) Information -

Courses:	Not applicable

- Duplication Information (not to be used for cross/dual-listings) -

Curriculum:	Neuroscience

- 1.0 Course Description Information -

1.1 Catalog description:

A study of designated special topic in neuroscience. Students may repeat this class as long as the specific topic is not duplicated.

1.2 Prerequisites of the course:

NEUR 1500, junior-senior status, instructor permission

1.3 Overview of content and purpose of the course:

This course will provide for an in-depth study of a designated topic in neuroscience that is not the focus of an existing course in the neuroscience curriculum. This course has multiple, overlapping aims:

1. It will provide students with "just in-time" courses that address focused content stemming from emerging research in neuroscience.

2. It will introduce students to specific methodology and content that is not covered in-depth in existing classes in the neuroscience curriculum.

3. It will allow faculty affiliated with the neuroscience program to "test-drive" a class in a specific content area to evaluate whether there is strong student interest and hone their approach to teaching new content prior to developing a formal syllabus for the class in the neuroscience curriculum.

1.4 Unusual circumstances of the course:

NEUR 4900 focused on a specific content area may be taught in different semesters up to three times. After that, it should be developed as a separately numbered neuroscience class.

A Neuroscience-affiliated faculty member interested in teaching NEUR 4900 will develop a proposal for the class for review and approval by the Neuroscience faculty prior to it being made available for student registration. The proposal will include descriptions of the topical focus of the course, the perfomance objectives stated as student learning outcomes, the major topics central to the course, the teaching methology and student role, the means of evaluation and critera for grading, and the resource material available to students in the course.

This course may be offered online or in person, or both.

- 2.0 Course Justification Information -

2.1 Anticipated audience / demand:

This class is offered to undergraduate, upper-level majors in neuroscience and other NU-system students by permission of instructor.

By providing a means to offer new content in neuroscience, this class will be attractive to NEUR majors who seek to complete the degree requirements and electives with classes focusing directly on neuroscience (as opposed to classes in BIOL or PSCY whose focus is often elsewhere).

2.2 Indicate how often this course will be offered and the anticipated enrollment:

This class will be offered about twice per year by different faculty in the NEUR program. Multiple sections of this class, focusing on different topics in neuroscience, may be offered by different faculty in one semester.

2.3 If it is a significant change to an existing course please explain why it is needed:

- 3.0 Objective Information -

Is this course part of or being proposed for the General Education curriculum?

No

3.1 List of performance objectives stated as student learning outcomes:

Variable. A list of performance objectives stated as student learning outcomes specific to the topic of the course will be developed by each instructor and submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration.

Example Topic: Optogenetics

Students will demonstrate proper handling of Drosophila Larvae

Students will identify larval behaviors and their natural roles

Students will measure behaviors quantitatively.

Students will identify types of experimental manipulation done to modify larval behavior.

Students will explain how manipulations might be used to demonstrate the relationship between sensory processing and the CNS-generated motor responses.

Students will design an experimental manipulation to alter a behavior and develop a quantitative method to assess the behavior and evaluate the response to the experimental manipulation.

Students will identify the types of circuits underlying larval behaviors.

Students will explain the following:

- what underlies sensory processing
- how can circuits be identifed and viisualized using genetic and optogenetic methods
- how can can GPF and channelrhodopsins be expressed in defined subsets of neurons

Students will document observations and quantitative measures of neuronal expression of GFP in defined neuronal populations.

Students will design crosses to generate larvae with channelrhodopsin and GFP coexpressed in defined subsets of neurons.

Students will generate hypotheses about the involvement of defined neuronal populations in larval behaviors. Evaluate these hypotheses by obtaining and analyzing quantitative data on behavioral responses to blocking or activating defined populations of neurons using transgenic animals expressing channelrhodopsins.

3.2 General Education Student Learning Outcomes

After completing the course, successful students shall be able to do the following:

- *4.0 Content and Organization Information* -

4.1 List the major topics central to this course:

Variable. A list of major topics specific to the topic of the course will be developed by each instructor and submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration, be available to students via the Neuroscience program web site at the time of student registration, and discussed with registered students during the first week of class. Example: Optogenetics --Intro to Optogenetics, Larval Behavior in Drosophilia, Quantifying Behavioral Responses, Nueronal Circuits, Designing Crosses.

- *5.0 Teaching Methodology Information* -

5.1 Methods:

Variable, though it is expected that active learning and inquiry-based learning strategies will be routinely employed. The pedagogical strategies for each special topics class will be submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration.

5.2 Student role:

All special topics classes will require students to actively contribute to class discussion and be critically engaged in evaluating material pertinent to the course content. Specific expectations of students' role in a special topics class will be provided to students during the first week of class.

- *6.0 Evaluation Information* -

Students should be provided the actual list of projects, basis for determining the final grade, and grading scale at the beginning of each course.

6.1.1 Describe the typical types of student projects that will be the basis for evaluating student performance:

Variable, though it is expected that all special topics classes will require students to complete exams write essays, literature reviews, and/or laboratory reports, and develop classroom presentations, as deemed appropriate by the course instructor to support mastery of the class content. The specific types of student projects used for determining the final grade, and an approximate grading scale, for a special topics class will be submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration, and provided to students during the first week of class.

Example: Optogenetics

The class is designed for students to work individually or in pairs in the laboratory, therefore attendance and active participation is required. Students may need to come in to prepare or perform laboratory work at times other than scheduled class sessions. For this, mutually convenient times will be arranged with the instructor.

Each student will prepare a research-style paper and presentation based on their own laboratory work. If they work with a partner in the lab, each member of the team will contribute to the presentation.

To encourage students to read independently and learn the material, four quizzes and/or problem sets will be given.

6.2 Describe the typical basis for determining the final grade (e.g., weighting of various student projects):

For a lecture class, the grade will typically be based on a weighting of class participation (10%), written assignments such as several to many short papers or a few longer papers (30%), presentations (20%) and exams (40%). For a course that has a laboratory component, some or all of the written assignments may be in the form of laboratory reports that incorporate a literature review. The specific basis for determining the final grade in a special topics class will be submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration, and provided to students during the first week of class.

Example: Optogenetics

Attendance and participation: 24%

Research paper and presentation: 52%

Quizzes or problem sets: 24%

6.3 Grading type:

Letter grades

- *7.0 Resource Material Information* -

7.1 Textbook(s) or other required readings used in course:

This information will vary with the topic of the class. The textbook(s), if used, and a list of other required reading will be submitted for review and approval to faculty in the Neuroscience program prior to making the course available for student registration. This information will be provided to students on the first class day.

7.2 Other student suggested reading materials:

This information will vary with the topic of the class. If used, this will be submitted for review by faculty in the Neuroscience program prior to making the course available for student registration. This information will be provided to students on the first class day.

7.3 Current bibliography and other resources:

This information will vary with the topic of the class. It will be provided for review to faculty in the Neuroscience program prior to making the course available for student registration. This information will be provided to students on the first class day.

Example: Optogenetics

1. Abdala AP, Paton JF, Smith JC. Defining inhibitory neurone function in respiratory circuits: Opportunities with optogenetics? J Physiol. 2014 Nov 10. [Epub ahead of print] PubMed PMID: 25384785.
2. Akerboom J, Carreras Calderón N, Tian L, Wabnig S, Prigge M, Tolö J, Gordus A, Orger MB, Severi KE, Macklin JJ, Patel R, Pulver SR, Wardill TJ, Fischer E, Schüler C, Chen TW, Sarkisyan KS, Marvin JS, Bargmann CI, Kim DS, Kügler S, Lagnado L, Hegemann P, Gottschalk A, Schreiter ER, Looger LL. Genetically encoded calcium indicators for multi-color neural activity imaging and combination with optogenetics. Front Mol Neurosci. 2013 Mar 4;6:2. doi: 10.3389/fnmol.2013.00002. eCollection 2013. PubMed PMID: 23459413; PubMed Central PMCID: PMC3586699.
3. Alger BE, Nagode DA, Tang AH. Muscarinic cholinergic receptors modulate inhibitory synaptic rhythms in hippocampus and neocortex. Front Synaptic Neurosci. 2014 Sep 5;6:18. doi: 10.3389/fnsyn.2014.00018. eCollection 2014. Review. PubMed PMID: 25249974; PubMed Central PMCID: PMC4155787.
4. Bath DE, Stowers JR, Hörmann D, Poehlmann A, Dickson BJ, Straw AD. FlyMAD: rapid thermogenetic control of neuronal activity in freely walking Drosophila. Nat Methods. 2014 Jul;11(7):756-62. doi: 10.1038/nmeth.2973. Epub 2014 May 25. PubMed PMID: 24859752.
5. Bertram EH. Extratemporal lobe circuits in temporal lobe epilepsy. Epilepsy Behav. 2014 Sep;38C:13-18. doi: 10.1016/j.yebeh.2014.07.012. Epub 2014 Sep 16. Review. PubMed PMID: 25238899.
6. Beyer HM, Naumann S, Weber W, Radziwill G. Optogenetic control of signaling in mammalian cells. Biotechnol J. 2014 Sep 12. doi: 10.1002/biot.201400077. [Epub ahead of print] PubMed PMID: 25216399.
7. Boyle PM, Karathanos TV, Trayanova NA. "Beauty is a light in the heart": The transformative potential of optogenetics for clinical applications in cardiovascular medicine. Trends Cardiovasc Med. 2014 Oct 16. pii: S1050-1738(14)00179-0. doi: 10.1016/j.tcm.2014.10.004. [Epub ahead of print] Review. PubMed PMID: 25453984.
8. Cao G, Platisa J, Pieribone VA, Raccuglia D, Kunst M, Nitabach MN. Genetically targeted optical electrophysiology in intact neural circuits. Cell. 2013 Aug 15;154(4):904-13. doi: 10.1016/j.cell.2013.07.027. Epub 2013 Aug 8. PubMed PMID: 23932121; PubMed Central PMCID: PMC3874294.
9. Cheng MY, Wang EH, Steinberg GK. Optogenetic Approaches to Study Stroke Recovery. ACS Chem Neurosci. 2014 Sep 26. [Epub ahead of print] PubMed PMID: 25259689.
10. Deng W, Goldys EM, Farnham MM, Pilowsky PM. Optogenetics, the intersection between physics and neuroscience: light stimulation of neurons in physiological conditions. Am J Physiol Regul Integr Comp Physiol. 2014 Dec 1;307(11):R1292-R1302. doi: 10.1152/ajpregu.00072.2014. Epub 2014 Oct 1. Review. PubMed PMID: 25274906.
11. Doll CA, Broadie K. Impaired activity-dependent neural circuit assembly and refinement in autism spectrum disorder genetic models. Front Cell Neurosci. 2014 Feb 7;8:30. doi: 10.3389/fncel.2014.00030. eCollection 2014. Review. PubMed PMID: 24570656; PubMed Central PMCID: PMC3916725.

Accommodations are provided for students who are registered with UNO Disability Services and make their requests sufficiently in advance. For more information, contact Disability Services (MBSC 111, Phone: 402.554.2872, TTY: 402.554.3799) or visit the web at http://www.unomaha.edu/disability.

8.2 Other:

* 8.3 Author(s):

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