

1. General Information

1a. Submitted by the College of: ARTS & SCIENCES

Date Submitted: 12/15/2014

1b. Department/Division: Biology

1c. Contact Person

Name: Elizabeth Debski

Email: debski@uky.edu

Phone: 323-9537

Responsible Faculty ID (if different from Contact)

Name:

Email:

Phone:

1d. Requested Effective Date: Semester following approval

1e. Should this course be a UK Core Course? No

2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: No

2b. Prefix and Number: BIO 305

2c. Full Title: Introduction to Neuroscience Techniques

2d. Transcript Title: NA

2e. Cross-listing: PSY 305 ANA 305

2f. Meeting Patterns

LECTURE: 2

LABORATORY: 4

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 4

2i. Is this course repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester?

2j. Course Description for Bulletin: This introductory laboratory course will provide students with practical knowledge and hands-on experience in basic behavioral, anatomical and physiological techniques used by laboratory scientists in the investigation of the nervous system. It is designed as a gateway to independent research experiences in working neuroscience laboratories.

2k. Prerequisites, if any: BIO 302 Introduction to Neuroscience or equivalent

2l. Supplementary Teaching Component:

3. Will this course taught off campus? No

If YES, enter the off campus address:

4. Frequency of Course Offering: Spring,

Will the course be offered every year?: Yes

If No, explain:

5. Are facilities and personnel necessary for the proposed new course available?: Yes

If No, explain:

6. What enrollment (per section per semester) may reasonably be expected?: 25

7. Anticipated Student Demand

Will this course serve students primarily within the degree program?: Yes

Will it be of interest to a significant number of students outside the degree pgm?: Yes

If Yes, explain: The course, once established, will be added to the list of courses that students could use to fulfill their neuroscience minor requirements. Presently, around 70 students are pursuing a neuroscience minor.

8. Check the category most applicable to this course: Relatively New – Now Being Widely Established,

If No, explain:

9. Course Relationship to Program(s).

a. Is this course part of a proposed new program?: Yes

If YES, name the proposed new program: A new Neuroscience major in A&S..

b. Will this course be a new requirement for ANY program?: Yes

If YES, list affected programs: It will be required as part of the new Neuroscience major.

10. Information to be Placed on Syllabus.

a. Is the course 400G or 500?: No

b. The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from 10.a above) are attached: Yes

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1.How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2.How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3.How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4.Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5.How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6.How do course requirements ensure that students make appropriate use of learning resources?

7.Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8.How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)?

9.Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10.Does the syllabus contain all the required components? NO

11.I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|VCASS2|Vincent Cassone|BIO 305 NEW Dept Review|20141217

SIGNATURE|ACSI222|Anna C Harmon|BIO 305 NEW College Review|20150303

SIGNATURE|JMETT2|Joanie Ett-Mims|BIO 305 NEW Undergrad Council Review|20150331

Introduction to Neuroscience Techniques

BIO/PSY/ANA 305 (4 credits)

Instructor: Dr. Elizabeth Debski

Office Address:

Email:

Office Phone:

Office hours:

Lab Instructor: TBA

Lectures: Two hour lecture (W 3-5 pm)

Lab: Four Hour Lab (Section 1: Th 1-5 pm; Section 2: F 1-5 pm)

Location: New Academic Science Building

Course Description: This introductory laboratory course will provide students with practical knowledge and hands-on experience in basic behavioral, anatomical and physiological techniques used by laboratory scientists in the investigation of the nervous system. It is designed as a gateway to independent research experiences in working neuroscience laboratories.

Prerequisite: BIO 302 Introduction to Neuroscience or equivalent

Professors: The laboratory exercises in this course have been designed by Drs. Elizabeth Debski (Dept of Biology), Jim Geddes (Dept. of Anatomy and Neurobiology) and Mark Prendergast (Dept. of Psychology) to give students a controlled, research experience in neuroscience.

Lectures will be delivered by the lecturer and/or another neuroscience program faculty member as dictated by the material to be covered each week.

Teaching Assistants: The laboratory sessions will be taught by two teaching assistants. A third TA will be assigned to carry out the laboratory prep work under the guidance of the course instructor.

Required materials: All lab materials will be provided (except notebooks).

Learning Outcomes: By the end of the class, students will be expected to be able to:

- 1) Understand laboratory approaches to examining unanswered questions in neuroscience.
- 2) Design an experiment using scientific methodology.
- 3) Collect behavioral, anatomical and physiological data.
- 4) Statistically analyze experimental results.
- 5) Communicate scientific problems, approaches, results and conclusions to a reader.
- 6) Be ready to carry out successful independent research projects in either BIO 394, PSY 393 or ANA 394.

Reading Assignments: Students should read the relevant readings, as listed in the syllabus, prior to the lecture.

Grading: Grades will be determined by performance on two objective examinations, laboratory notebook maintenance, two written laboratory papers and one oral presentation.

One hourly mid-term examination and a cumulative final will be given. Tests will be a mixture of multiple choice and short answer questions and will cover the material presented in the lectures and the readings. Each exam will be graded out of 100 points and will contribute 20% of the student's final grade (total: 40%).

Since maintenance of a good laboratory notebook enables scientific success, notebooks will be collected at three unannounced times during the semester and checked for completeness and accuracy. The grade for each check will count for 5% of the grade (total: 15%).

Additionally, there will be two papers due that present the results from the major laboratory sections (behavioral, anatomical and physiological). Papers should be written in the format used in the *Journal of Neuroscience* and have an abstract, as well as an introduction, methods, results, discussion and reference sections. Suggested length for each paper is 10-15 pages. Each paper is worth 20% of the final grade (total: 40%). **The first paper will be due Oct 9 and the second, Dec 4.**

At the end of the course, students will choose one of their written papers to orally present to the class. Presentations should be on the order of ten minutes and must include visual aids. Each presentation must include an introduction, and results and discussion sections. The presentation will be worth the final 5% of your grade.

Extra credit assignments are NOT available.

Course Grade: Numbers will be assigned to individual exams and papers. A final letter grade for the course will be determined by averaging these scores (weighting them appropriately) and applying the scale below:

A 100-90.0%
B 89.9-80.0%
C 79.9-70.0%
D 69.9-60.0%
E below 60.0%

The instructors reserve the option of grading more leniently than the listed scale should circumstances warrant it. However, under no circumstances will grading be more rigorous than the listed scale.

Identification: Bring a picture ID to all examinations.

Student Code: Students are expected to abide by the UK Student Code (<http://www.uky.edu/StudentAffairs/Code/>); thus, no cheating of any kind will be tolerated. Cheating is a serious academic offense. Persons found to be cheating during the exams or *plagiarizing on their writing assignment* will suffer at least the minimum punishment - a zero on the exam/assignment for a first offense. An additional penalty may be imposed, such as extra work, reduced letter grade, or a grade of E/F. A second offense is penalized by a grade

of E/F. You can view the UK policy on cheating at:
<http://www.uky.edu/Ombud/acadoffenses/index.htm>

Please keep in mind while completing your writing assignment that any information or ideas that you get from sources must be credited to those sources by citation. This includes material gotten from websites. Even when credited, you must put the material into your own words unless you use quotation marks. Failure to credit or re-word material (whether intentional or not) is plagiarism. A complete definition of plagiarism and some tips on how to avoid it can be found at:
<http://www.uky.edu/Ombud/Plagiarism.pdf>

Missed Exams/Assignments: Students must notify the instructor of their absence for an exam prior to the absence or within **one week** after the absence. A missed exam will result in a score of zero, unless an acceptable excuse, including any written documentation, is presented to the instructor within one week of the missed exam. Make-up exams will only be given for excused absences as defined by the University (<http://www.uky.edu/StudentAffairs/Code/part2.html>). They will consist of discussion, short answer or multiple choice questions and will be administered during the week before the final examination. It is the student's responsibility to contact the instructor to arrange a make-up exam. For any other missed work due to an excused absence, the student will need to contact the instructor within one week of the absence and will be allowed to make up the work. Depending on the nature of the missed work, an alternative assignment may be provided.

Absences for major religious holidays also require one week **advanced** written notification to the instructor.

Accommodations due to disability:

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

General Information: **September 3** is the last day to reduce course load and receive an 80 percent refund. The last day to drop a course without it appearing on your transcript is **September 17**. **September 24 is the last day to drop a course and receive any refund for it from the University.** Midterm grades will be entered **October 13-24**. **November 7** is the last day to officially withdraw from a class in the Fall 2014 semester.

Final Exam Schedule: *Wednesday 12/17/14 at 10:30 AM in 116 THM*

Lecture and Lab Schedule:

Neuro Methods

Day	Date	Lecture Topics
Wed.	27-Aug	Introduction Methods to quantify rodent behavior (Open Field)
Wed	3-Sep	Forming hypotheses and writing research reports, Elevated plus maze
Wed	10-Sep	Vertebrate and Invertebrate Models in Neuroscience
Wed	17-Sep	Histology
Wed	24-Sep	Basic Microscopy
Wed	1-Oct	Advanced Microscopy (Confocal)
Wed	8-Oct	Immunohistochemistry
Wed	15-Oct	Mid-term Exam
Wed	22-Oct	Basic Cell Culture 1
Wed	29-Oct	Cell Culture 2
Wed	5-Nov	Neurophysiology 1
Wed	12-Nov	Neurophysiology 2
Wed	19-Nov	Human Brain Imaging
Wed	26-Nov	Thanksgiving break
Wed	3-Dec	Human Neuropathology
Wed	10-Dec	Oral Presentations
Day	Date	Lab
Thur	28-Aug	Introduction to Lab Notebooks, Open field behavior in 2 strains of mice
Thur	4-Sep	Writing a research report, elevated plus maze in mice
Thur	11-Sep	Invertebrate Behavior
Thur	18-Sep	Histology (sectioning, cresyl violet staining)
Thur	25-Sep	Imaging, Basic Microscopy
Thur	2-Oct	Imaging, Confocal Microscopy
Thur	9-Oct	Immunohistochemistry and Choline Acetyltransferase Staining Paper Due
Thur	16-Oct	Protein Quantitation: ELISA and Western Blots
Thur	23-Oct	Cell Culture (preparing medium, plating)
Thur	30-Oct	Cell Culture (imaging cultures, neurotoxicity assay)
Thur	6-Nov	Neurophysiology 1
Thur	13-Nov	Neurophysiology 2
Thur	20-Nov	fMRI Demonstration
Thur	27-Nov	Thanksgiving Break
Thur	4-Dec	Human Neuropathology (Brain Cutting) Paper Due
Thur	11-Dec	Wrap-up and Discussion

Readings

1. *Lab Notebooks*

<http://www.ruf.rice.edu/~bioslabs/tools/notebook/notebook.html> Notebooks

2. *Rodent Behavior*

Discovering Neurons: The Experimental basis of Neuroscience (Cold Spring Harbor Laboratory Press) Section III: Laboratory 1;

3. *Vertebrate and Invertebrate Models in Neuroscience*

Watch excerpts from the film "The Squid and its Giant Nerve Fiber" at <http://www.science.smith.edu/departments/neurosci/courses/bio330/squid.html>

Read "Vertebrate versus invertebrate neural circuits" at <http://www.sciencedirect.com/science/article/pii/S0960982213006349>

4. *Histology*

Current Protocols in Neuroscience, Unit 1.1 <http://onlinelibrary.wiley.com/book/10.1002/0471142301/toc>
Discovering Neurons, Protocol 4: Nissl Stain

5. *Microscopy*

Readings for Basic Microscopy

How Light Microscopes Work:
<http://science.howstuffworks.com/light-microscope.htm> (all 7 pages)

Introduction to Fluorescence Microscopy:
<http://www.microscopyu.com/articles/fluorescence/fluorescenceintro.html>

Readings for Confocal Microscopy:
<http://www.microscopyu.com/articles/fluorescence/fluorescenceintro.html> (Intro, Part 1 and 2)
<http://www.microscopyu.com/articles/confocal/confocalintropreparation.html> (Specimen Prep)
<http://www.microscopyu.com/articles/confocal/confocalintroimaging.html> (Imaging Modes)

6. *Immunohistochemistry*

Discovering Neurons, Section II, Laboratory 3 (Immunocytochemistry); Unit 1.1 Current Protocols in Neuroscience.

7. *Analytic Chemistry*

Discovering Neurons, Section I, Laboratory 2

8. *Cell Culture*

Current Protocols in Cell Biology, Chapter 1

9. *Neurophysiology*

Chapters 1, 2 and 3 on Action Potentials in the online Neuroscience textbook:
<http://neuroscience.uth.tmc.edu/s1/index.htm>

Chapter 4: Synaptic Transmission and the Skeletal Neuromuscular Junction (online Neuroscience textbook) <http://neuroscience.uth.tmc.edu/s1/chapter04.html>

Electromyogram recordings from freely moving animals by Patrick Whelan:
<http://www.ucalgary.ca/whelanlab/files/whelanlab/electromyogram-recordings.pdf>

Experiment: Introduction to Conduction Velocity (Neural Speed)
<https://www.backyardbrains.com/experiments/speed>

Experiment: Comparing Speeds of Two Nerve Fiber Sizes
<https://www.backyardbrains.com/experiments/comparingNerveSpeed>

Experiment: Getting Started with the EMG SpikerBox:
<https://www.backyardbrains.com/experiments/emgspikerbox>

Experiment: Exploring Rate of Fatigue
<https://www.backyardbrains.com/experiments/rateoffatigue>

10. Brain Imaging

<https://faculty.washington.edu/chudler/image.html>
<http://learn.genetics.utah.edu/content/addiction/brainimaging/>

11. Neuropathology

Selected sections from:
<http://neuropathology-web.org/>
<http://library.med.utah.edu/WebPath/CNSHTML/CNSIDX.html>