BioS 482 Molecular and Developmental Neurobiology Laboratory CRN #39387

Course Syllabus

Instructors:
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Laboratory Times: Tuesday and Thursday, 2-5pm SEL 4068

Course Description: Elucidating the mind’s inner workings is one of the remaining challenges facing neuroscientists today. Since Ramón y Cajal’s first illustrations of neuronal structures, neuroscientists have benefited from new ways to visualize and understand the microscopic components within the brain. The implement of modern, advanced techniques holds the promise for elucidating a better understanding of the how the brain works. Already, many of these tools offer researchers novel methods for peering into the structure and function of the brain. This course (BioS 482) will explore the most recent neurotechniques and how these are being used to advance our knowledge of the brain.

During this course, the lecturers will:
• Provide an overview of new neurotechniques, including high power fluorescent microscopy, optogenetic manipulation of neuronal circuits, whole genome sequencing, and laser surgery.
• Present recent research using these new technologies
• Shed light on how to use these new technologies to advance research


Office Hours: Drs. Chang and Chuang will hold office hours Tuesday right after the class, SEL 4068. The TA will hold office hours Thursday right after the lab practice, SEL 4068.

Attendance Policy: Attendance is expected at all scheduled classes. Attendance is REQUIRED at all labs, scheduled presentations, and final essay, except in cases of illness, mandatory religious obligations, official University activities, and family emergencies. To be excused from attending labs, presentations, and final essay, an official medical certificate or an affidavit is required. The students will be assigned by last names alphabetically (A-Z) to present research papers on five scheduled dates. If you have an excused absence with appropriate documentation for your scheduled presentation, please contact the TA as soon as possible before the absence and the TA will arrange an alternative date for your presentation. If you have an unexcused absence (vacation travel, overslept, any absence without contacting the TA or instructors, etc), any missed work will be recorded as a zero.

Academic Dishonesty Policy: Any student caught copying others’ work on an assignment
or exam, plagiarism, or cheating in any other way will receive a zero for that assignment or exam and will be referred to the Student Judicial Affairs Committee, the Department Chair and/or Dean. Be sure to give proper attribution when using others' work in laboratory assignments.

**Students with disabilities:** Students with disabilities who require accommodations for access and participation in this course must be registered with the Office of Disability Services (ODS); they can be reached at 312-413-2103 (voice) or 312-413-0123 (TTY).

**GRADING:**
- Laboratory Reports (total: 2) = 25%
- Laboratory Worksheets (total: 9) = 35%
- Article Presentation = 20%
- Final Essay = 20%

A standard grading scale (90% A, 80% B, etc) will be used, unless otherwise determined at the end of the course, depending on the performance of the entire class. To help the ones on the borderline, the total grade was rounded up if it is =0.5 or >0.5. For instance, 89.50 will be rounded up to 90 and A, and 89.49 will not be rounded up, and therefore, B.

*If there is a question with grading of laboratory reports or laboratory worksheets, the student should let the TA know in the lab practice section within a week after the graded reports or worksheets are returned to the students. After that time is up, there is nothing can be done with the grading.*

*Laboratory reports and laboratory worksheets need to be submitted to the TA in person at the end of lab practice on the indicated due date. Laboratory reports or laboratory worksheets submitted via email will not be accepted/graded. The student who fails to turn in a laboratory report or a laboratory worksheet at the end of lab practice on the scheduled due date will receive a zero for that assignment.*

*Make-up laboratory reports and make-up laboratory worksheets are only allowed with appropriate documentation as mentioned in the attendance policy. Make-up presentations and make-up labs are not allowed for any reason.*

**NOTE:** We reserve the right to make changes in this syllabus. Any changes will be announced in class or posted on Blackboard. Coming to class will be important for keeping current on if and how the syllabus changes.

**Week 1 (Jan. 16, 18)**
- Lecturers: Drs. Chang & Chuang
- Overview of syllabus
- Laboratory: Group assignments (No lab practice)

**Week 2 (Jan. 23, 25)**
- Lectures: Drs. Chang & Chuang
Neuronal cell fate toolbox and neuronal structural markers
Laboratory: Stereo microscopy and high power fluorescence microscopy

Week 3 (Jan. 30, Feb. 1)
Lecture: Dr. Chuang
Neuronal asymmetry
Laboratory: Fluorescence microscopy of neuronal asymmetry in live animals

NEURONAL ASYMMETRY WORKSHEET due on Feb. 1.

Week 4 (Feb. 6, 8)
Lecturer: Dr. Chang
Axon pathfinding
Laboratory: Fluorescence microscopy of axon guidance in live animals

NEURONAL ASYMMETRY LAB REPORT and AXON GUIDANCE WORKSHEET due on Feb. 8.

Week 5 (Feb. 13, 15)
Lecturer: Dr. Chang
Neuronal regeneration
Laboratory: Imaging analysis of neuronal regeneration in live animals

AXON REGENERATION WORKSHEET due on Feb. 15

Week 6 (Feb. 20, 22)
Lecture: Dr. Chang
Dendrite patterning
Laboratory: Fluorescence microscopy of dendrite patterning in live animals

DENDRITE PATTERNING WORKSHEET due on Feb. 22.

Week 7 (Feb. 27, March 1)
Lecture: Dr. Chang and Chuang
Temporal and spatial control of gene expression
Laboratory: Heat-shock induction of gene expression

DENDRITE PATTERNING LAB REPORT and CONTROL OF GENE EXPRESSION WORKSHEET due on March 1.

Week 8 (March 6, 8)
Lecture: Dr. Chang
Emotional behaviors (courtship and aggression)
Laboratory: Male mating behavior
Week 9 (March 13, 15)
Lecture: Dr. Chuang
   Navigation and social behaviors
Laboratory: Social behaviors

MALE MATING WORKSHEET due on March 13
SOCIAL BEHAVIOR WORKSHEET due on March 15

Week 10 (March 20, 22)
Lecture: Dr. Chuang
   SNP mapping and whole genome sequencing (WGS)
Laboratory: Computational analysis of whole genome sequencing results

WHOLE GENOME SEQUENCING WORKSHEET due on March 22

Week 11 (March 27, 29)
Spring break. NO class.

Week 12 (April 3, 5)
The Brain series on Aggression_Dr. Chang
iBiology series: Genes, the brain and behavior_Dr. Chuang

Week 13 (April 10, 12)
Lecture: Dr. Chuang
   Neuronal fate switch
Laboratory: Fluorescence microscopy of neuronal fate switch in live animals

TOPICS AND JOURNAL INFORMATION OF PRESENTATIONS due on April 10
NEURONAL FATE SWITCH WORKSHEET due on April 12

Week 14 (April 17, 19)
Student Presentations

Week 15 (April 24, 26)
Student Presentations

Week 16 (May 1, 3)
Student Presentations and Final Essay

Final Essay due on May 3