MCB 163L: Mammalian Neuroanatomy Lab
4 units

Course Description:
Development, structure (gross and microscopic), and functional relationships of the mammalian nervous system. (Fall)

Organization:
The course consists of 1 hour of lecture and two 3 hour lab sessions a week. Lectures are on Mondays 2-3pm. Laboratory sections are listed below.

<table>
<thead>
<tr>
<th>LAB</th>
<th>Days</th>
<th>Time</th>
<th>Students</th>
</tr>
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<tbody>
<tr>
<td>LAB1</td>
<td>TuTh</td>
<td>9 – 12 pm</td>
<td>25 students</td>
</tr>
<tr>
<td>LAB2</td>
<td>TuTh</td>
<td>2 – 5 pm</td>
<td>25 students</td>
</tr>
<tr>
<td>LAB3</td>
<td>MW</td>
<td>9 – 12 pm</td>
<td>25 students</td>
</tr>
<tr>
<td>LAB4</td>
<td>MW</td>
<td>2 – 5 pm</td>
<td>25 students</td>
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Pre-requisites:
Prerequisites: Biology 1A/1AL, Molecular and Cell Biology 160 but can be taken concurrently. Molecular and Cell Biology 161 is recommended.

Textbook & Readings:

Grading
Grades on this class are based on work in lab, 3 reports and 3 exams.

Grade distribution will be as follows:
- Lab Section Grade 4 %
- 3 Lab Reports (6% Each) 18 %
- 3 Exams (26 % each) 78 %

Instructors:
- Henk Roelink
- Robin Ball
- Stephan Lammel
## Schedule: (Labs start on Week 2)

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Sep 5  | Introduction to Anatomical Terms + Gross Anatomy of the Brain + Introduction to Cranial Nerves | **Lab 1:** Human Brain Gross Observation  
**Lab 1:** Sheep Brain Dissection (Dura, Cranial Nerves)  
**Lab 2:** Sheep Brain Dissection (Sagittal and Horizontal Planes) |

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<tr>
<th>Week 2</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Sep 12 | Gross Anatomy focus on subcortical structures + Development | **Lab 3:** Sheep Brain Dissection (Subcortical Structures)  
**Lab 4:** Development of the Nervous System [Models + Slides] |

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<tr>
<th>Week 3</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Sep 19 | History and Current Applications of the Allen Brain Atlas | **Lab 5:** Introduction to Allen Brain Atlas / Brain Explorer + Initial Exercise  
**Lab 6:** Research Project using Allen Brain Atlas |

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<tr>
<th>Week 4</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Sep 26 | Sensory Systems (for the next week) | **Lab 7:** Research Project using Allen Brain Atlas  
**Lab 8:** Presentation of Allen Brain Atlas Projects  
**REPORT IN 1 WEEK: ALLEN BRAIN ATLAS PROJECT** |

### EVENING EXAM 1 ON TOPICS OF WEEKS 1 - 4

<table>
<thead>
<tr>
<th>Week 5</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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</table>
| Oct 3  | Detail Anatomy of spinal cord and brainstem | **Lab 9:** Sensory Systems Histology (Slices of Retina, Inner Ear, etc) + Cow eye ball dissection.  
**Lab 10:** Rat Brain: Spinal Cord to Medulla [Slides + Human Case Study] |

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<tr>
<th>Week 6</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Oct 10 | Detail Anatomy of Subcortical Structures | **Lab 11:** Rat Brain: Pons to Diencephalon [Slides + Human Case Study]  
**Lab 12:** Rat Brain: Basal Ganglia / Hippocampus / Telencephalon [Slides + Human Case Study] |

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<tr>
<th>Week 7</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Oct 17 | Immunohistochemistry Principles | **Lab 13:** - Look at slices stained using different non-fluorescent labels.  
- Using prepared slices students conduct 1st day of an immunohistochemistry protocol (In wet Chambers, students work on this individually)  
**Lab 14:** - Using fluorescent microscopes looking at fluorescent sample slices.  
- Secondary Antibody staining  
Possibilities: Class uses different concentrations of Ab |

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<tr>
<th>Week 8</th>
<th>Lecture Topic</th>
<th>Lab Topics</th>
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| Oct 24 | Image Data Analysis | **Lab 15:** Looking at own slices using microscopy and taking pictures.  
Using IMAGEJ to Analyze the Pictures they take.  
**Lab 16:** Introduction to Cortical Mapping Techniques (Lecture).  
- Journal Club discussion using Jigsaw method  
**REPORT IN 1 WEEK: ON IMMUNOHISTOCHEMISTRY** |

### EVENING EXAM 2 ON TOPICS OF WEEKS 5 – 8
<table>
<thead>
<tr>
<th>Week 9</th>
<th>External Expert gives Neurological Exam Lecture Video online to review.</th>
<th><strong>Lab 17</strong>: Neurological Exam (conducted by GSIs trained by expert) Student Conduct Neurological Exam on Classmates that were previously assigned specific illnesses to research. <strong>Lab 18</strong>: EEG Lab</th>
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</thead>
<tbody>
<tr>
<td>Oct 31</td>
<td>fMRI (guest lecturer)</td>
<td><strong>Lab 19</strong>: fMRI Project / MRI – Case Studies – Data Lab Cancelled due to Veteran's Day.</td>
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<tr>
<td>Week 10</td>
<td>Introduction to Electrophysiological Principles</td>
<td><strong>Lab 20</strong>: Electrophysiology: Equipment I (160L) <strong>Lab 21</strong>: Electrophysiology: Equipment II (160L)</td>
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<td>Nov 7</td>
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| Week 11 | Nerve Recordings, Nerve Conduction, Compound APs | **Lab 22**: Electrophysiology: Frog Sciatic Nerve Recordings I (160L) **Lab 23**: Electrophysiology: FSN Recordings II (160L)
REPORT IN 1 WEEK: FROG SCIATIC NERVE |
| Nov 14 | | |
| Week 12 | | |
| Nov 28 | | EVENING EXAM 3 ON TOPICS OF WEEKS 9-12 |

**Classrooms to be used:**
- Labs 1-19 will take place in the current room used for MCB 163L → 4048 VLSB (assuming we can bring in the Fluorescent Microscopes if we use them)
- Lab 18 will require bringing in external equipment to room 4048 VLSB (EEG lab)
- Labs 20-23 would be conducted in the MCB 160L space.

**Animal Protocol Changes to be Made:**
We need to include Frogs into our Animal Protocol.

**Biological Materials Used in the lab / year:**
- HumanBrains (in existence, should also try to procure more.)
- ~ 400 Sheep Brains with Dura (easy to order)
- ~ 100 Cow eyes (easy to order)
- ~70 Frogs
- ~5 rats (we only use 3 normally).
- Antibodies for Immunohistochemistry.

**Additional Equipment Needed, not currently used in MCB 163L:**
- From 160L:
  - EEG electrodes + setup
  - Equipment for Labs 1 and 2 of 160L
- Fluorescent Microscopes + Cameras (if available).
- Neurological Exam Tools.
- Development Slides.
- Development Models.
- Tupperware for wet-chambers.
- Sample fluorescent slides.

**NUMBER OF GSIs NEEDED:** 4