MCB 165: Neurobiology of Disease.

Course Description:
The molecular, cellular, and neural circuit basis of neurological disease. Includes neurochemistry and reward systems, neural development and its disorders, addiction, neurodegenerative and neuropsychiatric disorders. (SP) Caporale

Organization:
The course consists of 2 hours of lecture and 1 hour of discussion per week. Discussion sections will be led by the instructor in conjunction with a GSI.

Primary literature and discussion sections:
You will read primary scientific literature in this class, and discuss it in Friday sections. To prepare for discussion, you must answer several short questions on a “Reading Guide” about each week’s paper, and bring your answers to section with you. These will be the basis for discussion. Your answers to the reading guide questions will be turned in at section. Completion of the Reading Guide questions, and active participation in discussion, will contribute to your course grade.

Pre-requisites:
This course is designed as an elective after the 160-161 sequence. MCB 160 is pre-requisite, and MCB 161 is perquisite or co-requisite.

Textbook & Readings:

Unfortunately, there is not one single textbook that covers all these topics in adequate level of details. We will use the book Principles of Neural Science, by Kandel, as it is one of the most comprehensive resources available and we hope that students will have it from MCB 160. However, due to the novelty of some of the topics that we will cover, we will be complementing textbook readings with current reviews and articles.

Grading Policy
Grades on this class are based on exams (2 midterms, 1 final), the completion of literature analysis guides (5) and discussion section participation. The final exam is comprehensive.

Course grades will be calculated as follows:
Reading Guide Questions 5 %
Discussion Participation 5 %
Two Midterms 50 % (25 % each)
Final 40 %
# Schedule:

<table>
<thead>
<tr>
<th>Day</th>
<th>Lec #</th>
<th>Topic</th>
<th>Chap</th>
<th>Discussion (Friday)</th>
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</thead>
<tbody>
<tr>
<td>Tu</td>
<td>1</td>
<td>Introduction to the course</td>
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<tr>
<td>Th</td>
<td>2</td>
<td>Neurotransmitters: synthesis, receptors, degradation</td>
<td>KS: 11, 12, 13</td>
<td>How to read primary research papers</td>
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<tr>
<td>Tu</td>
<td>3</td>
<td>Neuromodulators: peptides, catecholamines</td>
<td>KS: 13</td>
<td>Glia, blood flow and fMRI</td>
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<td>Th</td>
<td>4</td>
<td>Glia in health and disease</td>
<td>KS: 4 &amp; ZC: 30</td>
<td>Homeostatic and Hebbian Plasticity</td>
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<tr>
<td>Tu</td>
<td>5</td>
<td>Presynaptic modulators: cannabinoids, adenosine</td>
<td>KS: 11, 13</td>
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<td>Th</td>
<td>6</td>
<td>Synaptic Plasticity</td>
<td>KS: 66</td>
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<tr>
<td>Tu</td>
<td>7</td>
<td>Psychoactive Drugs &amp; Reward Systems: VTA and nACC</td>
<td>KS: 46, 49</td>
<td>Circuit Basis for Addiction</td>
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<td>Th</td>
<td>8</td>
<td>Addiction</td>
<td>KS: 49 &amp; ZC: 35</td>
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<tr>
<td>Tu</td>
<td></td>
<td><strong>In-Class Exam I (Lec 1-8)</strong></td>
<td></td>
<td>Autoimmune disease and nervous system</td>
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<td>Th</td>
<td>9</td>
<td>The mysterious enteric nervous system</td>
<td>KS: 47</td>
<td></td>
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<tr>
<td>Tu</td>
<td>10</td>
<td>Review of Development and Synaptogenesis</td>
<td>KS: 52-56</td>
<td>Autism genetics and risk</td>
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<td>Th</td>
<td>11</td>
<td>Autism</td>
<td>KS: 64 &amp; ZC: 2, 6</td>
<td>mGlus and Fragile X</td>
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<tr>
<td>Tu</td>
<td>12</td>
<td>Fragile X</td>
<td>KS: 64 &amp; ZC: 8</td>
<td>Neurobiology of aging</td>
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<tr>
<td>Th</td>
<td>13</td>
<td>Other DD: Down Syndrome and ADHD</td>
<td>ZC: 4, 5</td>
<td>Axonal regeneration after injury</td>
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<tr>
<td>Tu</td>
<td>14</td>
<td>Prion Diseases</td>
<td>ZC: 23</td>
<td></td>
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<td>Th</td>
<td>15</td>
<td>The Aging Brain</td>
<td>KS: 59</td>
<td></td>
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<tr>
<td>Tu</td>
<td>16</td>
<td>Parkinson and Huntington Disease</td>
<td>KS:43 &amp; ZC:19,20</td>
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<tr>
<td>Th</td>
<td>17</td>
<td>Spinal cord organization and injury.</td>
<td>ZC: 15</td>
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<tr>
<td>Tu</td>
<td>18</td>
<td>Stem cells, regeneration, and repair.</td>
<td>KS: 57</td>
<td>Mental illness and society</td>
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<tr>
<td>Th</td>
<td>19</td>
<td>Overview of Mood and Psychotic Disorders</td>
<td>KS: 63</td>
<td>Animal models of psychiatric disorders</td>
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<tr>
<td>Th</td>
<td>20</td>
<td>Depression and Manic Disorder: Symptoms</td>
<td>ZC: 40, 43</td>
<td>Synaptic plasticity in amygda</td>
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<tr>
<td>Tu</td>
<td>21</td>
<td>D&amp;MD: Monoamine, corticoid and neurotrophic hypothesis</td>
<td>ZC: 40, 43</td>
<td>Drug development for novel therapeutics</td>
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<td>Th</td>
<td>22</td>
<td>Anxiety Disorder, PTSD and the Amygdala</td>
<td>ZC: 37</td>
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<td>Th</td>
<td>24</td>
<td>Schizophrenia: Glutamate and Dopamine Hypothesis</td>
<td>KS: 62 &amp; ZC:39</td>
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<tr>
<td>Tu</td>
<td>25</td>
<td>Dementia and Alzheimer's Disease</td>
<td>KS: 59 &amp; ZC: 21</td>
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<td>Th</td>
<td>26</td>
<td>Epilepsy</td>
<td>KS: 50 &amp; ZC: 17</td>
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**SPRING BREAK**

| Tu  | 18    | Stem cells, regeneration, and repair.                                 | KS: 57          | Mental illness and society        |
| Th  | 19    | Overview of Mood and Psychotic Disorders                              | KS: 63          | Animal models of psychiatric disorders |
| Th  | 20    | Depression and Manic Disorder: Symptoms                               | ZC: 40, 43      | Synaptic plasticity in amygda    |
| Tu  | 21    | D&MD: Monoamine, corticoid and neurotrophic hypothesis               | ZC: 40, 43      | Drug development for novel therapeutics |
| Th  | 22    | Anxiety Disorder, PTSD and the Amygdala                              | ZC: 37          |                                   |
| Th  | 24    | Schizophrenia: Glutamate and Dopamine Hypothesis                     | KS: 62 & ZC:39  |                                   |
| Tu  | 25    | Dementia and Alzheimer's Disease                                     | KS: 59 & ZC: 21 |                                   |
| Th  | 26    | Epilepsy                                                             | KS: 50 & ZC: 17 |                                   |

**RRR week (Lectures on Tu and Th will meet to review Lectures 1-18)**

| Fri |       | GSI Led Review Session on Lectures 21-28 (Location & Time TBD)      |                 |                                   |
|     | TBD   | Comprehensive Final Exam @ , Time TBD , Location TBD                |                 |                                   |