

DEREE COLLEGE SYLLABUS FOR: BI 3232 CELLULAR AND MOLECULAR NEUROBIOLOGY		3/0/3						
(Updated: Fall 2024)		<b>UK LEVEL: 5</b> <b>UK CREDITS: 15</b>						
<b>PREREQUISITES:</b>	BI 1000 Introduction to Biology I BI 1101 Introduction to Biology II							
<b>CATALOG DESCRIPTION:</b>	The course will cover neuron morphology, neurophysiology, neurochemistry and neuroanatomy, sensory receptor systems, motor systems, neurodevelopment and the biology of higher cognitive function.							
<b>RATIONALE:</b>	This course, in recent years, is considered an essential part of undergraduate education in life sciences and psychology. The course will present a coherent description of the nervous system and sense organs from the perspective of modern work on molecular biology, cellular and developmental biology, biophysics, neurophysiology, neurochemistry and neuroanatomy.							
<b>LEARNING OUTCOMES:</b>	<i>As a result of taking this course, the student should be able to:</i> 1. Describe the basic structure and function of neurons and glial cells. 2. Evaluate the mechanisms of neuronal electrical activity. 3. List the various neurotransmitters, their receptors, and their function. 4. Analyze the molecular mechanisms of transduction mechanisms. 5. Evaluate the mechanisms of action of the sensory systems. 6. Evaluate neural plasticity and brain behavior.							
<b>METHOD OF TEACHING AND LEARNING:</b>	In congruence with the teaching and learning strategy of the college, the following tools are used: <ul style="list-style-type: none"><li>• Class lectures, interactive learning (class discussions, group work) audiovisual presentations, model and other laboratory demonstrations such as microscopy slides, transparencies, plastomounts, charts, etc., and practical problems solved in class.</li><li>• Exercises and primary source documents are assigned as homework, the solutions of which are reviewed in class.</li><li>• Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture/lab material.</li><li>• Use of library facilities for further study and preparation for the exams.</li><li>• Use of the Blackboard course management platform to further support communication, by posting lecture notes, assignment instruction, timely announcements, formative quizzes and online submission of assignments.</li></ul>							
<b>ASSESSMENT:</b>	<table><tr><td colspan="2">Summative:</td></tr><tr><td>1<sup>st</sup> assessment: In-class midterm examination (2-hour) (short answers, matching, essay questions combination, problem solving)</td><td>40%</td></tr><tr><td>2<sup>nd</sup> assessment: Portfolio (throughout semester)</td><td>10%</td></tr></table>		Summative:		1 <sup>st</sup> assessment: In-class midterm examination (2-hour) (short answers, matching, essay questions combination, problem solving)	40%	2 <sup>nd</sup> assessment: Portfolio (throughout semester)	10%
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	<table><tr><td>Essay questions aiming to prepare students for their midterm and final exams including assigned time management tasks.</td><td></td></tr><tr><td>Final assessment: In-class final examination (2-hour, comprehensive) (short answers, matching, essay questions combination, problem solving)</td><td>50%</td></tr></table> <p><b>Formative:</b></p> <table><tr><td>Multiple "diagnostic on-line" tests Multiple choice, short answers</td><td>0</td></tr><tr><td>Essay questions</td><td>0</td></tr></table> <p>The formative assessments aim to prepare students for the examinations. Students are expected to submit feedback on their performance.</p> <p>The 1<sup>st</sup> assessment (midterm examination) tests Learning Outcomes 1-3. The 2<sup>nd</sup> assessment tests Learning Outcomes 1-6. The final assessment (final examination) tests all Learning Outcomes (1-6) and it is comprehensive.</p> <p><i>The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment. If students pass the comprehensive assessment that tests all Learning Outcomes for this module and the average grade for the module is 40 or higher, students are not required to resit any failed assessments.</i></p>	Essay questions aiming to prepare students for their midterm and final exams including assigned time management tasks.		Final assessment: In-class final examination (2-hour, comprehensive) (short answers, matching, essay questions combination, problem solving)	50%	Multiple "diagnostic on-line" tests Multiple choice, short answers	0	Essay questions	0
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Multiple "diagnostic on-line" tests Multiple choice, short answers	0								
Essay questions	0								
<b>INDICATIVE READING:</b>	<p><b>REQUIRED READING:</b></p> <p>1. Levitan, I.R. and Kaczmarek, L.K., The Neuron. Cell and Molecular Biology, latest edition. Oxford University Press, Inc., New York. 2. Cross P. C. and Mercer L.K., Cell and Tissue Ultrastructure, A Functional Perspective, latest edition, W.H. Freeman, and Company, New York. 3. Instructor’s lecture notes on blackboard.</p> <p><b>RECOMMENDED READING:</b> Other sources, including journal and newspapers’ articles, research papers etc. recommended by the instructor throughout the semester.</p>								
<b>INDICATIVE MATERIAL:</b> (e.g. audiovisual, digital material, etc.)	<p><b>REQUIRED MATERIAL:</b> N/A</p> <p><b>RECOMMENDED MATERIAL:</b> N/A</p>								
<b>COMMUNICATION REQUIREMENTS:</b>	Verbal and written skills using academic / professional English								
<b>SOFTWARE REQUIREMENTS:</b>	MS Office and Blackboard CMS								
<b>WWW RESOURCES:</b>	<a href="http://www.dnalc.org">http://www.dnalc.org</a>								

	<p> <a href="http://www.sciam.com">www.sciam.com</a>  <a href="http://www.sumanasinc.com/webcontent/animation.html">http://www.sumanasinc.com/webcontent/animation.html</a>  <a href="http://www.ninds.nih.gov/index.htm">http://www.ninds.nih.gov/index.htm</a>  <a href="http://www.nlm.nih.gov/medlineplus/braindiseases.html#news">http://www.nlm.nih.gov/medlineplus/braindiseases.html#news</a>  <a href="http://www.mb.jhu.edu/tins.asp">http://www.mb.jhu.edu/tins.asp</a>  <a href="http://www.whfreeman.com/delcomyn/INDEX.HTM">http://www.whfreeman.com/delcomyn/INDEX.HTM</a>  <a href="http://www.brainatlas.org/aba/">http://www.brainatlas.org/aba/</a>  <a href="http://www.blackwellpublishing.com/matthews/animate.html">http://www.blackwellpublishing.com/matthews/animate.html</a> </p> <p>More Links</p> <ol style="list-style-type: none"> <li>1. Laboratory of Neuroimaging, UCLA  <a href="http://www.loni.ucla.edu/About_Loni/index.shtml">http://www.loni.ucla.edu/About_Loni/index.shtml</a> </li> <li>2. Atlas of Ultrastructural Neurocytology  <a href="http://synapses.mcg.edu/atlas/0_1.stm">http://synapses.mcg.edu/atlas/0_1.stm</a> </li> <li>3. Gel Electrophoresis of DNA and RNA  <a href="http://arbl.cvmbs.colostate.edu/hbooks/genetics/biotech/gels/index.html">http://arbl.cvmbs.colostate.edu/hbooks/genetics/biotech/gels/index.html</a> </li> <li>4. Learning Education and Research Network  <a href="http://learn.sahs.uth.tmc.edu/prototype_2002/index.htm">http://learn.sahs.uth.tmc.edu/prototype_2002/index.htm</a> </li> <li>5. Neuroanatomy Slide Lectures  <a href="http://anatomy.yonsei.ac.kr/LWT/neuroanatomy.htm">http://anatomy.yonsei.ac.kr/LWT/neuroanatomy.htm</a>  <a href="http://anatomy.yonsei.ac.kr/LWT/PowerPoint.htm">http://anatomy.yonsei.ac.kr/LWT/PowerPoint.htm</a> </li> <li>6. Neurocytology, Nervous System Diseases and more  <a href="http://www.sci.uidaho.edu/med532/Disease_index.htm">http://www.sci.uidaho.edu/med532/Disease_index.htm</a> </li> <li>7. Neuroanatomy and Neuropathology  <a href="http://www.neuropat.dote.hu/index.htm">http://www.neuropat.dote.hu/index.htm</a> </li> </ol>
<b>INDICATIVE CONTENT:</b>	<p>Introduction to the Cellular Structure of Neurons and Glia</p> <ol style="list-style-type: none"> <li>I. Electrical Properties of Neurons             <ol style="list-style-type: none"> <li>1. Electrical Signaling</li> <li>2. Ion Channels and Membrane Ion Currents</li> <li>3. Combinations of Ion Currents</li> <li>4. Structure and Function of Ion Channels</li> </ol> </li> <li>II. Intercellular Communication             <ol style="list-style-type: none"> <li>5. How Neurons Communicate: Gap Junctions and Neurosecretion</li> <li>6. Synaptic release of Neurotransmitters</li> <li>7. Neurotransmitters and Neurohormones</li> <li>8. Receptors and Transduction Mechanisms</li> <li>9. Neuromodulation</li> <li>10. Sensory Receptor Neurons</li> </ol> </li> <li>III. Behavior and Plasticity             <ol style="list-style-type: none"> <li>11. Growth, Survival, and Differentiation of Neurons</li> <li>12. Adhesion Molecules and Axon Pathfinding</li> <li>13. Formation, Maintenance, and Plasticity of chemical Synapses</li> <li>14. Neural Networks and Behavior</li> <li>15. Learning and Memory</li> </ol> </li> </ol>