

**DEREE COLLEGE SYLLABUS FOR: BI 3232 CELLULAR AND MOLECULAR NEUROBIOLOGY****UK LEVEL: 5  
UK CREDITS: 15  
US CREDITS:3/0/3**

(Updated Fall 2022)

**PREREQUISITES:**BI 1000 Introduction to Biology I  
BI 1101 Introduction to Biology II**CATALOG DESCRIPTION:**

A course on cellular and molecular neurobiology. The course will cover the neuron morphology, neurophysiology, neurochemistry and neuroanatomy, sensory receptor systems, and motor systems, neuro development and the biology of higher cognitive function.

**RATIONALE:**

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.

**LEARNING OUTCOMES:**

- As a result of taking this course, the student should be able to:
1. Describe the basic structure of neurons and glial cells and the special roles they play in the nervous system.
  2. Evaluate the mechanisms of neuronal electrical activity
  3. List the various neurotransmitters and how they function. Associate neurotransmitters to various receptors and their functions.
  4. Examine the transduction mechanisms.
  5. Analyze the molecular mechanisms that govern the way messages are transmitted.
  6. Evaluate the mechanisms of action of the sensory systems.
  7. Evaluate neural plasticity and brain behaviour

**METHOD OF TEACHING AND LEARNING:**

- In congruence with the learning and teaching strategy of the college, the following tools are used:
- 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.
  - Exercises and primary source documents are assigned as homework, the solutions of which are reviewed in class
  - CD-ROMS (Genetics-From Genes to Genomes, The Unity and Diversity of Life, The Dynamic Human, Explorations in Cell Biology & Genetics, Explorations in Human Biology.)
  - 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.
  - Use of a blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources.

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<b>ASSESSMENT:</b>	<b>Summative:</b>	
	<b>First Assessment</b> In-class midterm examination (2-hour) (short answers, matching , essay questions combination, problem solving)	<b>40%</b>
	<b>Second Assessment</b> In-class final examination (2-hour, comprehensive) (short answers, matching , essay questions combination, problem solving)	<b>50%</b>
	<b>Third assessment</b> Portfolio Essay questions aiming to prepare students for their midterm and final exams including assigned time management tasks	<b>10%</b>
	<b>Formative:</b>	
	Multiple "diagnostic on-line" tests Multiple choice, short answers essay questions	0 0
<p>The <b>formative MC (on-line) and written essays</b> aim to prepare students for the examination. Students are expected to submit feedback on their performance. The midterm examination tests Learning Outcomes 1-3. The final examination tests all learning outcomes 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>		
<b>INDICATIVE READING:</b>	<p><b>REQUIRED READING:</b> <b>Required Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Levitan, I.R. and Kaczmarek, L.K. The Neuron. Cell and Molecular Biology. Oxford University Press, Inc., New York, (latest edition).</li> <li>2. Cross P. C. and Mercer L.K. Cell and Tissue Ultrastructure, A Functional Perspective, W.H. Freeman, and Company, New York (latest edition)</li> <li>3. Instructor's lectures notes on blackboard</li> </ol> <p><b>RECOMMENDED READING:</b> N/A</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>	N/A	
<b>SOFTWARE REQUIREMENTS:</b>	Microsoft Word, Microsoft PowerPoint, Blackboard CMS	

<b>WWW RESOURCES:</b>	<p><a href="http://www.dnalc.org">http://www.dnalc.org</a> <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 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></p>
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	<p>2. Atlas of Ultrastructural Neurocytology  <a href="http://synapses.mcg.edu/atlas/0_1.stm">http://synapses.mcg.edu/atlas/0_1.stm</a></p> <p>3. Gel Electrophoresis of DNA and RNA  <a href="http://arbl.cvmb.colostate.edu/hbooks/genetics/biotech/gels/index.html">http://arbl.cvmb.colostate.edu/hbooks/genetics/biotech/gels/index.html</a></p> <p>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></p> <p>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></p> <p>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></p> <p>7. Neuroanatomy and Neuropathology  <a href="http://www.neuropat.dote.hu/index.html">http://www.neuropat.dote.hu/index.html</a></p> <p>8. Neuroscience for Kids  <a href="http://faculty.washington.edu/chudler/introb.html#bb">http://faculty.washington.edu/chudler/introb.html#bb</a></p>
<p><b>INDICATIVE CONTENT (LEC):</b></p>	<p>1. An Introduction to the Cellular Structure of Neurons and Glia</p> <p>I. Electrical Properties of Neurons</p> <ol style="list-style-type: none"> <li>2. Electrical Signaling</li> <li>3. Ion Channels and Membrane Ion Currents</li> <li>4. Combinations of Ion Currents</li> <li>5. Structure and Function of Ion Channels</li> </ol> <p>II. Intercellular Communication</p> <ol style="list-style-type: none"> <li>6. How Neurons Communicate: Gap Junctions and Neurosecretion.</li> <li>7. Synaptic release of Neurotransmitters.</li> <li>8. Neurotransmitters and Neurohormones.</li> <li>9. Receptors and Transduction Mechanisms.</li> <li>10. Neuromodulation.</li> <li>11. Sensory Receptor Neurons.</li> </ol> <p>III. Behavior and Plasticity</p> <ol style="list-style-type: none"> <li>12. Growth, Survival, and Differentiation of Neurons.</li> <li>13. Adhesion Molecules and Axon Pathfinding.</li> <li>14. Formation, Maintenance, and Plasticity of chemical Synapses.</li> <li>15. Neural Networks and Behavior.</li> <li>16. Learning and Memory</li> </ol>