

**DEREE COLLEGE SYLLABUS FOR: BMS 4415 ENVIRONMENTAL BURDEN IN NEURODEVELOPMENT****UK LEVEL: 6**  
**UK CREDITS: 15**  
**US CREDITS: 3/0/3**

(Updated Fall 2022)

**PREREQUISITES:**BI 1000 Introduction to Biology I  
BI 1101 Introduction to Biology II  
BI 3235 Cell and Molecular Biology  
BI 3240 Human Anatomy and Physiology**CATALOG DESCRIPTION:**

The course focuses on fundamental principles of organogenesis in the nervous system and integrates information from a variety of model systems, relating them to human nervous system development trajectory, including disorders of development. It offers expanded coverage of topics such as neuronal determination, axonal navigation and targeting, neuron survival and death, synapse formation and developmental plasticity. Environmental exposures, epigenetics, gene expression, cell migration and stem cells, sleep and learning/memory, socioeconomic status and development of prefrontal cortex function are considered.

**RATIONALE:**

The course provides a detailed review of issues relating to the nature of brain- behaviour relationships and development. It focuses on fundamental principles of organogenesis in the nervous system and it integrates information from a variety of model systems, relating them to human nervous system typical and atypical brain development. The student systematically develops knowledge from the description of key experiments and results that guide the student to understanding the succeeding events in neural development. The patterning and growth of the nervous system, neuronal determination, axonal navigation and targeting, neuron survival and death, synapse formation and developmental plasticity are considered. The Environmental burden in neurodevelopment is also examined making the course suitable for biomedical students. Both genetic and environmental factors that influence development will be discussed. The course will conclude by focusing on experiential hazards that can derail development, such as the exposure to early adversity.

**LEARNING OUTCOMES:**

As a result of taking the course students should be able to:

1. Discuss the mechanisms associated with organogenesis in the nervous system relating them to human nervous system typical and atypical brain development.
2. Critically evaluate the use of research findings, imaging techniques, tests of physiological function and laboratory data in the identification, aetiology, diagnosis and pathogenesis of the nervous system.
3. Demonstrate a critical and analytical approach to specific case histories in relation to neurodevelopment and the role of the environment.
4. Discuss the consequences of selected disease states as a result of exposure to environment.
5. Conduct appropriate literature-based research/evaluation of relevant topics.

**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) video presentations, and practical problems solved in class.
- Exercises and primary source documents are assigned as homework, the solutions of which are reviewed in class
- Master lectures by retired professors and other experts in the field.
- Lectures on the principles and understanding of the subject matter, including original data from primary research papers and other sources.
- Tutorials of an interactive format to establish understanding of topic areas

	<p>primarily through case studies and experimentally derived data.</p> <ul style="list-style-type: none"> <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 a blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources.</li> </ul>												
<p><b>ASSESSMENT:</b></p>	<p><b>Summative:</b></p> <table border="1"> <tr> <td>First Assessment In-class midterm examination (2-hour) – summative</td> <td style="text-align: right;"><b>40</b></td> </tr> <tr> <td><b>Second Assessment</b> Final examination/Case Study (2-hour), comprehensive - summative.</td> <td style="text-align: right;"><b>60</b></td> </tr> <tr> <td><b>Third assessment</b> Portfolio- summative. Essay questions aiming to prepare students for their first and second assessments in terms of content, context and time management</td> <td style="text-align: right;"><b>10</b></td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>100</b></td> </tr> </table> <p><b>Formative:</b></p> <table border="1"> <tr> <td>Multiple "diagnostic on-line" tests</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Multiple choice/short answers/ essay questions</td> <td style="text-align: right;">0</td> </tr> </table> <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 1<sup>st</sup> summative assessment tests Learning Outcomes 1, 2 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>	First Assessment In-class midterm examination (2-hour) – summative	<b>40</b>	<b>Second Assessment</b> Final examination/Case Study (2-hour), comprehensive - summative.	<b>60</b>	<b>Third assessment</b> Portfolio- summative. Essay questions aiming to prepare students for their first and second assessments in terms of content, context and time management	<b>10</b>	<b>Total</b>	<b>100</b>	Multiple "diagnostic on-line" tests	0	Multiple choice/short answers/ essay questions	0
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<p><b>INDICATIVE READING:</b></p>	<p><b>REQUIRED READING:</b> Environmental Factors in Neurodevelopmental and Neurodegenerative Disorders 1st Edition Editors: Michael Aschner Lucio Costa eBook ISBN: 9780128004074 Hardcover ISBN: 9780128002285 Imprint: Academic Press Published Date: 15th July 2015</p> <p><b>RECOMMENDED READING:</b> Sanes, D., Reh, T. A., &amp; Harris, W. A. (2011). Development of the Nervous System. (3rd ed.) Elsevier Inc.</p> <p>Mark H. Johnson, Michelle de Haan, Developmental Cognitive Neuroscience: An Introduction, Wiley-Blackwell, Latest edition 4th Edition, ISBN: 978-1-118-93808-9 June 2015</p>												
<p><b>INDICATIVE MATERIAL:</b> <i>(e.g. audiovisual, digital material, etc.)</i></p>	<p><b>REQUIRED MATERIAL:</b> N/A <b>RECOMMENDED MATERIAL:</b> N/A</p>												
<p><b>COMMUNICATION REQUIREMENTS:</b></p>	<p>N/A</p>												
<p><b>SOFTWARE REQUIREMENTS:</b></p>	<p>Microsoft Word, Microsoft PowerPoint, Blackboard CMS</p>												

<b>WWW RESOURCES:</b>	<a href="https://www.nature.com/articles/nrg3934">https://www.nature.com/articles/nrg3934</a>
	<p><a href="https://chdm.duke.edu/research-areas/neurodevelopment-and-neurodegeneration">https://chdm.duke.edu/research-areas/neurodevelopment-and-neurodegeneration</a>  <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4829467/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4829467/</a>  <a href="http://www.dnalc.org">http://www.dnalc.org</a>  <a href="https://www.jove.com/visualize">https://www.jove.com/visualize</a>  <a href="https://biologicalproceduresonline.biomedcentral.com/">https://biologicalproceduresonline.biomedcentral.com/</a>  <a href="https://www.bitnos.com/biomedical-protocols">https://www.bitnos.com/biomedical-protocols</a>  <a href="https://www.ncbi.nlm.nih.gov/pubmed/">https://www.ncbi.nlm.nih.gov/pubmed/</a>  <a href="https://www.informaticseducation.org/">https://www.informaticseducation.org/</a>  <a href="http://imia-medinfo.org/wp/welcome-to-imia-2/">http://imia-medinfo.org/wp/welcome-to-imia-2/</a>  <a href="http://genomicsandhealth.org">http://genomicsandhealth.org</a>  <a href="https://www.humanbrainproject.eu/en/">https://www.humanbrainproject.eu/en/</a>  <a href="http://www.braininitiative.org/">http://www.braininitiative.org/</a>  <a href="https://www.alleninstitute.org/">https://www.alleninstitute.org/</a>  <a href="http://www.brain-map.org/">http://www.brain-map.org/</a></p>
<b>INDICATIVE CONTENT (LEC):</b>	<ul style="list-style-type: none"> <li>• Overview of the Role of Environmental Factors in Neurodevelopmental Disorders</li> <li>• Genetic Factors in Environmentally Induced Disease</li> <li>• Fetal Alcohol Spectrum Disorders: Effects and Mechanisms of Ethanol on the Developing Brain</li> <li>• Prenatal Infection: Setting the Course of Brain Aging and Alzheimer's Disease?</li> <li>• Neurobehavioral Effects of Air Pollution in Children</li> <li>• The Role of Methylmercury Exposure in Neurodevelopmental and Neurodegenerative Disorders</li> <li>• Developmental Exposure to Lead: Overview and Integration of Neurobehavioral Consequences and Mediation</li> <li>• Thyroid-Disrupting Chemicals as Developmental Neurotoxicants</li> <li>• Environmental Factors in Neurodevelopmental Disorders: Summary and Perspectives</li> <li>• Overview of Neurodegenerative Disorders and Susceptibility Factors in Neurodegenerative Processes</li> <li>• Environmental Neurotoxins Linked to a Prototypical Neurodegenerative Disease</li> <li>• Environmental Exposures and Risks for Parkinson's Disease</li> <li>• Parkinson's Disease: Mechanisms, Models, and Biological Plausibility</li> <li>• Genetic Models of Parkinson's Disease: Behavior, Signaling, and Pathological Features</li> <li>• Alzheimer's Disease and the Search for Environmental Risk Factors</li> <li>• Environmental Factors and Amyotrophic Lateral Sclerosis: What Do We Know?</li> <li>• Gene-Environment Interactions in Huntington's Disease</li> <li>• Neuroinflammation in Neurological Dysfunction and Degeneration</li> <li>• Late Neurological Effects of Early Environmental Exposures</li> <li>• Environmental Factors in Neurodegenerative Disorders: Summary and Perspectives</li> </ul>