

Subject Outline

Subject Name:	Neuroscience
Subject Code:	BION121
Award(s):	Bachelor of Health Science (Musculoskeletal Therapy)
Core/Elective:	Core - 2 credit points
Pre/co-requisites:	None
Student Workload:	39 hours face to face 36 hours self-directed study
Delivery Mode:	<p>Face to face</p> <ul style="list-style-type: none"> • 2 hours lecture • 1 hour tutorial <p>E-learning</p> <ul style="list-style-type: none"> • Narrated PowerPoint • Asynchronous tutor moderated discussion forums and activities • Student Handouts, Web based resources <p>Full Time Part Time</p>
Subject Coordinator:	Sue Sharpe (Melbourne campus)
Subject Rationale:	<ul style="list-style-type: none"> • The aim of this subject is to expand on the students' knowledge and application of neuroscience to the normal and diseased functioning of the human body. • In BION121 the students expand their information base in regards to the anatomy and physiology of the nervous system from micro structures within the brain to the macro structures of nerves and their pathways. • In addition areas that are important for disease within the nervous system are investigated such as the functional areas of the cerebral cortex, neuroplasticity, the upper and lower motor systems and the brainstem. • Students will relate the normal functioning of these areas through analysis to formulate how alterations can and will lead to clinical disorders.

Learning Outcomes:

1.	Integrate the development of the nervous system with the structure and function of the adult system.
2.	Describe the concepts of hardwiring and plasticity in the brain.
3.	Identify and describe the structure and function of the major areas of the nervous system.
4.	Identify the pathways taken throughout the body by the major nerves and the anatomical structures they are associated with from a clinical perspective.
5.	Describe dermatomes and myotomes and evaluate their clinical importance.
6.	Describe the major reflexes in the body and evaluate their importance within a clinical context.
7.	Describe the molecular biology of the synapse and analyse the factors externally and

	internally that can contribute to alteration in function and how this may contribute to dysfunction.
8.	Discuss the concept of emotion, its physiological nature and how it can alter the nervous system functioning.

Content:

Week	Topics	On Campus & Online Tutorial learning activities
1.	<p>Introduction – (Subject Outline / subject aims / assessment / teaching resources)</p> <ul style="list-style-type: none"> Review of the structure and function of the nervous system. Neuronal cell structure and function; membrane potentials. 	<p>Relevant activities for all teaching sessions are directed by the lecturers/tutors through in class discussion and activities or via the student discussion forum. Teaching and learning activities may be modified or adapted to suit the particular learning strategies and delivery style.</p> <p>Activities are developed to allow the students to explore relevant concepts, expand on ideas and have peer and lecturer/tutor interaction. Activities also allow for formative assessment and feedback.</p> <p>Lecture material has research informed content and tutorials are supported by the use of current relevant research papers.</p> <p>General topics for the week</p> <ul style="list-style-type: none"> Neuron theory of CNS function
2.	<p>The synapse revisited</p> <ul style="list-style-type: none"> Molecular biology of the synapse Intercellular signalling Neurotransmitters e.g. Myasthenia gravis Pre and post synaptic potentials 	<p>General topics for the week</p> <ul style="list-style-type: none"> Action potential generation Molecules involved in cell signalling (neurotransmitters)
3.	<p>The synapse revisited</p> <ul style="list-style-type: none"> Molecular biology of the synapse Receptors Intracellular signalling Immediate early gene responses Protein transcription Mitochondrial encephalopathy Review energy metabolism Nutrition and brain function 	<p>General topics for the week</p> <ul style="list-style-type: none"> Intracellular effects of cell signalling
4.	<p>Metabolism of the nervous system</p> <ul style="list-style-type: none"> Circulation of the brain Blood-brain-cerebrospinal fluid barriers Hypoxic-ischemic brain injury and oxidative stress e.g. stroke 	<p>General topics for the week</p> <ul style="list-style-type: none"> Clinical presentation of stroke

	<ul style="list-style-type: none"> Neuropathy e.g. diabetes; nerve compression 	
5.	<p>Movement and its central control 1</p> <ul style="list-style-type: none"> Lower motor neuron circuits and motor control. Influences on alpha motor neurons Upper motor neuron control of the brainstem and spinal cord Modulation of movement by the basal ganglia 	<p>General topics for the week</p> <ul style="list-style-type: none"> Upper and lower motor neurones
6.	<p>Movement and its central control 2</p> <ul style="list-style-type: none"> Modulation of movement by the cerebellum Proprioception and muscle spindle <p>Cerebellum balance and coordination</p> <ul style="list-style-type: none"> Vestibular structure and function Cerebellar structure and function 	<p>General topics for the week</p> <ul style="list-style-type: none"> Proprioception in rehabilitation Neurological aspects of motor and balance rehabilitation
7.	<p>The autonomic nervous system</p> <ul style="list-style-type: none"> ANS structure and function 	<p>General Topics for the week</p> <ul style="list-style-type: none"> ANS regulation of vital signs
<p>NON-TEACHING WEEK (note that make-up classes may be scheduled in this week) Semester 1 - This aligns with the week after Easter so it may fall between weeks 6 to 8. Semester 2 & Online students - The break week falls between Weeks 7 and 8.</p>		
8.	<p>Mid semester exam (Weeks 1-7)</p>	<p>Revision</p> <ul style="list-style-type: none"> Questions Case study
9.	<p>The structure and organisation of the cerebrum and complex brain functions, special senses</p> <ul style="list-style-type: none"> Functional areas, location and function The association cortices Language and lateralization Limbic system The special senses 	<p>General topics for the week</p> <ul style="list-style-type: none"> Hemispheric specialisation
10.	<p>The structure and organisation of the spinal cord and nerve pathways within the peripheries</p> <p>Location, anatomical relations and clinical importance, spinal reflexes</p>	<p>General topics for the week</p> <ul style="list-style-type: none"> Assessment of long tracts (temperature, light touch, pain, vibration)
11.	<p>Dermatomes and myotomes and their clinical importance and application</p> <p>Nerve compression classification</p>	<p>General topics for the week</p> <ul style="list-style-type: none"> Peripheral nerve compression
12.	<p>The cranial nerves and brainstem and their clinical importance and</p>	<p>General topics for the week</p> <p>Critical Thinking Assignment due</p>

	application	
13.	The changing brain <ul style="list-style-type: none"> • Early brain development • Construction of neural circuits • Modification of brain circuits as a result of experience • Human memory • Plasticity of mature synapses and circuits 	General topics for the week <ul style="list-style-type: none"> • Plasticity in the brain and rehabilitation
14-15.	Non-Teaching / Practical Exam Period. Note that make-up classes may be held during these weeks.	
16-17.	Final Exam Period On campus enrolled students: please refer to the Exam Timetable for your local campus for the exact day and time of exam. Online enrolled students: You are required to sit examinations on campus per the Examination Policy-Higher Education . The Exam Week for subjects offered online is identified in the Online Calendar for the current calendar year.	

Set Text Requirements:

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| 1. Tortora, G & Derrickson, B 2014, <i>Principles of anatomy and physiology</i> , 14 th edn, Wiley, Hoboken, NJ. |
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Recommended readings:

1. Purves, D, Augustine, GJ, Fitzpatrick, D, Hall, WC, LaMantia, A-S & White, LE (eds) 2012, <i>Neuroscience</i> , 5th edn, Sinauer Associates, Sunderland, MA.
2. Crossman, AR & Neary, D 2010, <i>Neuroanatomy: an illustrated colour text</i> , 4th edn, Elsevier Churchill Livingstone, Edinburgh.
3. Gates, P 2010, <i>Clinical neurology: a primer</i> , Elsevier Australia, Chatswood, NSW.
4. Michael-Titus, A, Revest, P & Shortland, P 2010, <i>The nervous system: basic science and clinical conditions</i> , 2nd edn, Churchill Livingstone Elsevier, Edinburgh.
5. Siegel, GJ, Albers, RW, Brady, ST & Price, DL (eds) 2012, <i>Basic neurochemistry: principles of molecular, cellular and medical neurobiology</i> , 8th edn, Elsevier Academic Press, Amsterdam.
6. Society for Neuroscience 2012, Brain facts: a primer on the brain and nervous system , 7th edn, Society for Neuroscience, Washington, viewed 10 March 2015, < http://erin.sfn.org/Resources/2012/03/20/BrainFacts-Primer >.

Assessment:

Assessment Item	Topic/s	Learning Outcomes Assessed	Week Content Delivered	Week Due	Weighting
1. Mid Semester Exam (May include multiple choice, diagrams, short answers, extended responses, problem solving: 1.5 hours)	Anatomy and function of the nervous system	1-5	1-6	8 (in class)	30%
2. Critical Thinking The assessment will be	Clinical Significance	1-8	1-11	12	40%



composed of a selection of critical thinking questions developed to allow the students to evaluate and interpret how the nervous system works in detail and how it impacts on the clinical situation (1000 words)					
3. Final Exam (May include multiple choice, diagrams, short answers, extended responses, problem solving) (1.5 hours)	All topics	1-8	1-13	Final Exam Period	30%
<p>Formative assessment will be undertaken early in the subject and then on a regular basis throughout the duration of the subject to provide students and staff with feedback on the learning. It may take the form of quizzes, small group and classroom presentations, writing activities, peer review where appropriate.</p> <p>Early formative assessment would be used to determine any necessary intervention strategies to ensure students are able to complete the program in the normal subject duration.</p> <p>Feedback will also be provided on summative assessment undertaken during semester.</p>					