



Course Code	Course Title	ECTS CREDITS
MED-301	Brain and Behaviour	6
School	Semester	Prerequisites
Medical School	Fall (Semester 5)	None
TYPE OF COURSE	Field	Language of Instruction
Required	Medicine	English
Level of Course	Year of Study	Course Lead
Undergraduate	3rd	Dr Stelios Georgiades Other lecturers: Prof Savvas Papacostas
Mode of Delivery	Work Placement	Co-requisites
Face-to-face	N/A	None

Objectives of the Course:

The overarching theme of the Brain and Behaviour course is that nervous system disorders can be understood in terms of neuroanatomical, physiological and psychological mechanisms to the extent this is possible given current knowledge.

The course objectives are:

- To understand how the nervous system functions as a whole.
- To provide a sound scientific basis for the understanding of the disorders of the nervous system.
- To gain an extended focus on higher cognitive functions, behaviour and mental health.
- To understand the role of psychological factors in the development of mental illness.
- To explore the relationship between mental illness and psychoneurological factors.

Individual topics include organization, function and dysfunction (e.g., lesion effects) of spinal cord, brainstem, cerebral cortex, and subcortical regions. Also included are the role of family and other environmental factors in the psychological wellbeing of individuals and their contribution to the development of behavioural difficulties and problems.

Clinical topics include Parkinson's disease, Huntington's disease, cerebellar disorders, Alzheimer's disease, multiple sclerosis, epilepsy, schizophrenia, depression, anxiety and personality disorders.

Learning Outcomes:

The following list provides the learning objectives that will be covered in the lectures, and tutorials of each week:

Week 1

Lobs covered during lectures and tutorials (Psychology):

1. Outline the institution of marriage.

2. Describe causes and rates of divorce.
3. Outline the role of socioeconomic status in families.
4. Describe the impact of health service utilisation in the overall state of the family.

Lobs covered during lectures and tutorials (Neurology):

5. Review the basic anatomy of the Nervous System and its divisions and Subdivisions.
6. Describe the Central Nervous System and Peripheral Nervous System components including: Central Nervous System: Brain and Spinal Cord, brain stem anatomy (cranial nerves and nuclei, reticular formation, blood supply), hypothalamic function, limbic system and emotional behaviour; Peripheral Nervous System: Somatic and Autonomic Nervous Systems, Autonomic Nervous System: Sympathetic and Parasympathetic Nervous Systems).
7. Describe the gross anatomy and blood supply of the brain and spinal cord.
8. Describe spinal reflexes.
9. 9. Outline the basic steps of embryonic development and the resultant nervous structures.
10. 10. Describe fetal maturation, and perinatal changes, including neural tube derivatives, cerebral ventricles, and neural crest derivatives.
11. Describe the basic cell/tissue structure and function of neurons.
12. Describe the role of the neurological exam.
13. Demonstrate the ability to systematically perform the neurological exam with emphasis on a working hypothesis derived from the history.
14. Describe the elements of the neurological exam, namely the orderly examination of the mental status, the cranial nerves, the motor exam, coordination, sensation, reflexes and gait and explain what any abnormal findings represent.

Week 2

Lobs covered during lectures and tutorials (Psychology):

15. Outline the link between Physical and Psychological Health.
16. Outline the effect of physical and psychological factors on suicide.
17. Outline patterns of human development.
18. Describe the concept of normality and abnormality in human development both from a physical and a psychological perspective.

Lobs covered during lectures and tutorials (Neurology):

19. Describe the usefulness and utility of the following diagnostic tests: Electroencephalography, Nerve Conduction Studies, Electromyography, Evoked Potentials, Computed tomography, Magnetic Resonance Imaging, Vascular imaging, Positron Emission Tomography.
20. Describe the tests that should be carried out depending on the patient's condition and working diagnosis.
21. Describe the basic techniques used in the performance of the following diagnostic tests: Electroencephalography, Nerve Conduction Studies, Electromyography, Evoked Potentials, Computed tomography, Magnetic Resonance Imaging, Vascular imaging, Positron Emission Tomography.
22. Describe the underlying anatomy/physiology involved in the application of the following diagnostic tests: Electroencephalography, Nerve Conduction Studies,

Electromyography, Evoked Potentials, Computed tomography, Magnetic Resonance Imaging, Vascular imaging, Positron Emission Tomography.

23. Define coma and discuss its causes.
24. Describe the processes that will have to take place to localize the site of dysfunction in a patient.
25. Outline the function of the Glasgow Coma Scale.
26. Describe the checking of brainstem reflexes, posturing reflexes and formulate a differential diagnosis.
27. Describe further laboratory investigations that can be used to evaluate coma.
28. Differentiate coma, persistent vegetative state, locked-in-syndrome, brain death.
29. Describe treatment options that should be used for comatose patients.

Week 3

Lobs covered during lectures and tutorials (Psychology):

30. Outline the role of sexuality in human cycle.
31. Describe current issues on sexual practices such as heterosexual and homosexual relations.
32. Outline the role of sexuality in the elderly.
33. Outline the most important sexual dysfunctions.
34. Outline the most important sexual deviations.

Lobs covered during lectures and tutorials (Neurology):

35. Describe the basic anatomy of the visual pathways.
36. Localize the site of dysfunction through appropriate examination.
37. Differentiate between monocular and binocular visual loss.
38. Identify the cause of Horner syndrome and other pupillary lesions (Adie's and Argyll Robertson pupils).
39. Identify optic disc abnormalities (papilloedema, drusen, optic neuritis, ischaemia) and discuss possible causes.
40. Outline the anatomy of eye movements and their abnormalities (diplopia, supranuclear palsies, nystagmus).
41. Outline the anatomy of major motor system pathways.
42. Explain how weakness can be caused by lesions along the entire neuraxis.
43. Identify the site of the lesion following appropriate examination (muscle, neuromuscular junction, peripheral nerve, nerve root, plexopathies, spinal cord, brainstem, cerebral hemispheres).
44. Differentiate brain and spinal cord (upper motor neuron) from lower motor neuron lesions.
45. Describe the use of appropriate tests (NCS/EMG, Imaging) for confirmation of the working diagnosis.
46. Describe the anatomy of various sensory systems and pathways.
47. Describe how sensory dysfunction can be caused by lesions along the entire neuraxis.
48. Discuss general sensory modalities, including sharp, dull, temperature, vibratory, and proprioception.
49. Describe the pathway of a signal from the periphery to the brain according to its modality.
50. Outline basic dermatomal distributions.

51. Explain special sensory modalities, including vision, hearing, taste, olfaction, and balance.
52. Demonstrate ability in examining the sensory system.
53. Localize anatomic site of lesions according to the examination.
54. Define terms such as paraesthesia, dysesthesia, hyperesthesia, allodynia and dissociated sensory loss.
55. Discuss pain syndromes such as RSD and Fibromyalgia

Week 4

Lobs covered during lectures and tutorials (Psychology):

56. Describe the origins of HIV/AIDS.
57. Describe the importance of AIDS/HIV counselling.
58. Outline the different types of substances often abused.
59. Describe the impact that different substances have on human behaviour.
60. Outline the types of treatments offered to people suffering from substance addictions.

Lobs covered during lectures and tutorials (Neurology):

61. Describe the various types of vertigo their pathophysiology and treatment.
62. Describe the association and implications of tinnitus, diplopia, dysarthria and other signs of brainstem dysfunction to vertigo.
63. Describe diagnostic and treatment manoeuvres for vertigo.
64. Define syncope and presyncope and explain their pathophysiology.
65. Describe the relationship of syncope to neurogenic syncope, autonomic failure and orthostatic hypotension.
66. Outline the anatomy of the cerebellum and its connections to other brain regions.
67. Describe the signs and symptoms of cerebellar disease.
68. Describe and identify cerebellar haemorrhage and infarction, alcoholic cerebellar degeneration, infectious cerebellitis, and paraneoplastic degeneration.
69. Discuss the various ataxias including Friedreich ataxia, Genetic ataxias and Miller Fisher syndrome.
70. Identify major gait disorders namely hemiparetic, akinetic rigid, frontal, waddling, proprioceptive and psychogenic.
71. Outline the anatomy and physiology of bladder incontinence.
72. Describe diagnostic tests in the evaluation of bladder dysfunction.
73. Differentiate between spastic and atonic bladder.
74. Describe the types of incontinence (urge, stress, mixed, overflow), their occurrence in neurologic disease, and their treatment.
75. Outline the basic causes, pathophysiology and treatment of erectile dysfunction.

Week 5

Lobs covered during lectures and tutorials (Psychology):

76. Outline the role of sleep.
77. Outline the different stages of sleep.
78. Describe the impact of total and selective sleep deprivation.
79. Outline the most common sleep disorders.

80. Describe the symptoms associated with the most common sleep disorders.
81. Outline the available treatments on sleep disorders.

Lobs covered during lectures and tutorials (Neurology):

82. Outline the different types of aphasia (Wernicke's, Broca's, transcortical etc.) and describe their anatomic distribution.
83. Describe the approach to evaluating aspects of language problems (fluency, repetition, comprehension, naming, reading, writing).
84. Explain the concepts of apraxia, agnosia and neglect, localize them anatomically and provide examples of each.
85. Describe non-dominant hemisphere syndromes.
86. Define dementia and delirium and discuss their differences and similarities and how they affect higher functions: cognition, language, memory, executive function.
87. Discuss the main causes of dementia and delirium and the approach to diagnosis and treatment.
88. Discuss common types of dementia (Alzheimer disease; frontotemporal dementia, including Pick disease, progressive supranuclear palsy, Lewy body Disease, vascular, Huntington and Parkinson dementia and metabolic dementias).
89. Discuss infections causing dementia (Creutzfeldt-Jakob and HIV).

Week 6

Lobs covered during lectures and tutorials (Psychology):

90. Outline the different areas of Psychopathology.
91. Outline the methods employed in the diagnosis of psychological and psychiatric disorders.
92. Outline the treatments often used in the treatment of psychiatric and psychological disorders.
93. Outline the most common adult psychiatric disorders.

Lobs covered during lectures and tutorials (Neurology):

94. Demonstrate proficiency in obtaining a history and examining a headache in a patient especially in identifying important signs such as meningismus, papilloedema, eye movement abnormalities and visual dysfunction.
95. Differentiate between the primary headache disorders (migraine, tension-type, cluster etc.) and discuss their treatment.
96. Differentiate between the secondary headache disorders (subarachnoid, low-pressure, idiopathic intracranial hypertension, temporal arteritis, chronic daily headaches) and discuss their treatment.
97. Discuss the diagnostic approach and treatment of facial pain syndromes.

Midterm Exam

Week 7

Lobs covered during lectures and tutorials (Psychology):

98. Outline the epidemiology, the method of assessment, diagnosis and treatment of Affective disorders.

99. Outline the epidemiology, the method of assessment, diagnosis and treatment of Anxiety disorders.
100. Outline the epidemiology, the method of assessment, diagnosis and treatment of Somatoform Disorders.

Lobs covered during lectures and tutorials (Neurology):

101. Describe the pathophysiology of seizure disorders, and define epilepsy.
102. Outline the classification of seizures including generalized (tonic-clonic, absence, tonic, clonic, atonic), partial (simple and complex) and febrile seizures.
103. Describe the epidemiology and aetiologies of seizures.
104. Describe the basic drugs used for different seizure types as well as other therapeutic options (diet, surgery, neurostimulation).
105. Describe the approach to a patient with epilepsy for clinical diagnosis and further testing (EEG, imaging etc.).
106. Outline how to approach and treat status epilepticus and give first aid in a seizure.
107. Discuss selected epilepsy syndromes (Lennox-Gastaut, Rolandic, Juvenile myoclonic).
108. Differentiate seizures from other paroxysmal events.
109. Outline special issues such as driving and epilepsy, pregnancy in women with epilepsy and psychogenic seizures.
110. Describe the role of the basal ganglia on motor function.
111. Describe how movement disorders can be hypo- or hyper-kinetic.
112. Differentiate between idiopathic Parkinson's disease and other Parkinsonian syndromes (PSP, CBGD, Vascular, MSA) with respect to pathophysiology, clinical diagnosis and treatment.
113. Describe the basic pharmacologic and surgical therapy for Idiopathic Parkinson's Disease (IPD).
114. Differentiate different types of tremor (resting, action, postural etc.).
115. Describe conditions such as dystonia, adult tic disease, essential tremor, Huntington, stiff person syndrome, chorea, ballism, myoclonus, Wilson disease, and paroxysmal dyskinesias.
116. Outline brain gross anatomy and blood supply including abnormalities such as arteriovenous malformations, ectatic cerebral vessels; cerebral artery aneurysm; carotid artery stenosis/atherosclerosis/occlusion/dissection; vertebral artery insufficiency/dissection; subclavian steal syndrome; venous sinus thrombosis.
117. Discuss the corresponding symptoms from vascular supply.
118. Describe the approach to transient ischemic attack.
119. Explain thrombotic stroke: cerebral artery occlusion/cerebral infarction/lacunar stroke.
120. Describe embolic stroke: cerebral embolism; intracerebral haemorrhage, including subarachnoid haemorrhage, traumatic intracranial haemorrhage; hypertensive encephalopathy; posterior reversible encephalopathy syndrome.

Week 8

Lobs covered during lectures (Psychology):

121. Outline the epidemiology, the method of assessment, diagnosis and treatment of Eating Disorders.

122. Outline the epidemiology, the method of assessment, diagnosis and treatment of Psychosis.

Lobs covered during (Neurology):

123. Recognize cardinal features of metabolic encephalopathies (fluctuating arousal, asterixis) and explain possible mechanisms.
124. Describe systemic illnesses that affect the Nervous System.
125. Outline common metabolic disorders affecting the Nervous System, specifically-sarcoidosis, diabetes, lupus, antiphospholipid antibody syndrome and thyroid disease.
126. Describe the multiple effects of alcohol and nutritional deficiency on the Nervous System.
127. Explain the implications of space-occupying lesions in the cranial and spinal areas.
128. Discuss benign tumours such as meningioma and neurofibromata.
129. Discuss malignant tumours, e.g. glioblastoma multiforme, astrocytoma, medulloblastoma, ependymoma, schwannoma, primary CNS lymphoma and their staging.
130. Differentiate metastatic (e.g. breast, lung, pancreatic, testicular, melanoma) from primary tumours.
131. Describe less common tumours such as ganglioglioma, hemangioblastoma, sellar and suprasellar.
132. Discuss management options for different tumour types.
133. Discuss common presenting features of tumours (headache, seizures, etc.).
134. Discuss the approach and therapy of different types of tumours.
135. Describe the differences between epidural and subdural hematoma (cerebral and spinal).
136. Outline the implications of intra-parenchymal haemorrhage, traumatic subarachnoid haemorrhage, and cerebral oedema.
137. Explain the concept of traumatic brain injury (concussion)/ post-concussion syndrome; traumatic brain syndrome and diffuse axonal injury.
138. Differentiate between various traumatic herniation syndromes (central, uncal, subfalcine).
139. Demonstrate competency in the initial approach and evaluation and treatment of head trauma including management of raised intracranial pressure.
140. Demonstrate proficiency using the Glasgow coma scale.

Week 9

Lobs covered during lectures and tutorials (Psychology):

141. Outline the characteristics and associated symptoms of all personality disorders.
142. Outline the difference between personality disorders and other psychological/psychiatric disorders.
143. Describe the epidemiology, the method of assessment, diagnosis and treatment of the different personality disorders.

Lobs covered during lectures and tutorials (Neurology):

144. Recognize and describe treatment of brain infective agents causing bacterial meningitis/encephalitis. Recognize and describe treatment of brain infective agents

causing viral meningitis/encephalitis.

145. Recognize and describe treatment of brain infective agents causing viral meningitis/encephalitis.
146. Recognize and describe treatment of brain infective agents causing fungal meningitis/encephalitis.
147. Describe spirochaetal infections including *Borrelia burgdorferi*, *Leptospira*, *Treponema pallidum* and their treatment.
148. Outline protozoal/helminthic infections.
149. Describe prion disease including Creutzfeldt-Jakob.
150. Explain botulism (*Clostridium botulinum*), tetanus (*Clostridium tetani*), and their treatment.
151. Describe CNS disorders associated with AIDS (e.g. progressive multifocal leukoencephalopathy).
152. Describe the epidemiology and common presentations of Multiple Sclerosis (MS).
153. Discuss possible clinical courses and prognosis of MS (benign, relapsing-remitting, primary progressive, secondary progressive).
154. Discuss the evaluation and treatment options of MS.
155. Describe acute disseminated encephalomyelitis.
156. Describe the relationship between neuromyelitis optical and MS.
157. Describe leukoencephalopathies (PML, PRES, Central pontine myelinolysis).
158. Describe adrenanoleukodystrophy.
159. Review CN anatomy and function.
160. Recognize common cranial nerve lesions/dysfunction: (Optic neuropathy; causes, treatment, prognosis and Oculomotor nerve palsy; causes, treatment, prognosis).
161. Review the anatomy of the cavernous sinus and nerves passing through.
162. Describe the findings in Bell's palsy.
163. Outline and describe treatment of Ramsey-Hunt syndrome, Vestibulocochlear lesions and dysfunction, Glossopharyngeal neuralgia, Accessory and hypoglossal nerve palsies.

Week 10

Lobs covered during lectures and tutorials (Psychology):

164. Outline the most common childhood psychiatric disorders.
165. Outline the epidemiology, the method of assessment, diagnosis and treatment of childhood affective disorders.
166. Outline the epidemiology, the method of assessment, diagnosis and treatment of childhood anxiety disorders.
167. Outline the epidemiology, the method of assessment, diagnosis and treatment of ADHD.

Lobs covered during lectures and tutorials (Neurology):

168. Review spinal cord anatomy and vasculature.
169. Explain anterior spinal artery syndrome.
170. Localize site of lesion/dysfunction in the spinal cord and utilize appropriate diagnostic tests.
171. Describe spinal cord syndromes and emergencies (transection, compression, hemicord syndromes, central cord lesions, cauda equine/conus lesions).

172. Describe congenital disorders and spinal stenosis (cervical/lumbar).
173. Diagnose, evaluate and treat Amyotrophic Lateral Sclerosis (ALS).
174. Recognize, classify and differentiate between radiculopathy, mononeuropathy (including mononeuropathy multiplex) and polyneuropathy.
175. Describe how to systematically approach peripheral nerve lesions/dysfunction.
176. Describe rational diagnostic evaluation.
177. Recognize, evaluate and treat immune-mediated neuropathies (Guillain-Barre, CIDP, MMN, M-protein associated).
178. Recognize, evaluate and treat metabolic, autonomic and infectious neuropathies.
179. Describe the pathophysiology and presentation of myasthenic syndromes and describe treatment options.
180. Classify intrinsic muscle disorders such as the dystrophinopathies, muscular dystrophies and describe treatment options.
181. Explain the utility of various diagnostic tests available for the diagnosis of neuromuscular disorders.
182. Outline mitochondrial, inflammatory, systemically-induced and toxic myopathies and describe treatment options.

Week 11

Lobs covered during lectures and tutorials (Psychology):

183. Outline brain hemispheric asymmetry and hemispheric dominance.
184. Outline the role of neuropsychological testing.
185. Describe the different types of neuropsychological tests used for assessing the functioning of different cortical areas.

Lobs covered during lectures and tutorials (Neurology):

186. Describe neural tube defects (spina bifida, holoprosencephaly, anencephaly).
187. Explain microcephaly.
188. Describe Sturge-Weber syndrome, tuberous sclerosis, von Hippel-Lindau disease.
189. Describe the dynamics of hydrocephalus (including normal pressure) and other obstructive conditions (Arnold-Chiari, pseudotumour cerebri/idiopathic intracranial hypertension).
190. Describe acute dystonic reaction and its culprits.
191. Discuss drug-induced meningitis and its causes (e.g., NSAIDs, sulfa drugs).
192. Discuss drug-induced neuropathies and their treatment (e.g., vincristine, isoniazid, metronidazole).
193. Recognize extrapyramidal adverse effects and their culprits (e.g., akathisia, dystonia, drug-induced Parkinsonism, tardive dyskinesia).
194. Describe neuroleptic malignant syndrome.
195. Describe poisoning by psychotropic agents, such as the antidepressants including the serotonin syndrome.
196. Explain the significance of non-organic symptom mimics in clinical neurology.
197. Describe voluntary vs involuntary symptoms and the issue of secondary gain.
198. Recognize underlying psychiatric disease in selected cases.
199. Describe the process of making appropriate referrals to mental health specialists.
200. Describe major presentations of functional/somatoform disorders (conversion, somatization, pain, hypochondriasis, malingering, factitious) and formulate a

therapeutic plan.

Week 12

Lobs covered during lectures and tutorials (Psychology):

201. Outline the role of testing in Neuropsychiatry and Neurorehabilitation.
202. Outline Personality Testing.
203. Describe the role of Personality Testing in the assessment of psychological and psychiatric disorders.

Lobs covered during lectures and tutorials (Neurology):

204. Recognize the need for a special approach to diagnosing paediatric neurology conditions.
205. Describe the basic developmental milestones of children.
206. Describe major neurological conditions in children such as MR/DD, Autism, Regression and Neurodegeneration, ADHD, and be able to suggest initial evaluation and recommend treatment.

Course Contents:

Psychology

- Family and Family Life
- Psychological Adjustment and Physical Health
- Sexuality
- HIV/AIDS and Substance Abuse
- The Function of Sleep
- Introduction to Psychopathology
- Adult Psychopathology
- Child Psychopathology
- Neuropsychological Assessment

Neurology

- Anatomy and physiology of the nervous system
- The neurologic examination
- Neurologic diagnostic procedures and cerebrospinal fluid haemodynamics
- Coma and other altered states of consciousness
- Neuro-ophthalmology
- Weakness
- Sensory system and sensory dysfunction
- Dizziness, Vertigo, Syncope
- Ataxia and gait disorders
- Urinary and sexual dysfunction
- Language dysfunction and other disorders of higher cortical function
- Dementia and delirium
- Cephalgia and facial pain
- Seizures and Epilepsy
- Movement disorders

- Cerebrovascular disease
- Systemic and Metabolic Disorders
- Tumours
- Head Trauma
- Infections
- Demyelinating Disorders
- Cranial nerve injury
- Disorders of the spinal cord
- Peripheral nerve injury/ disorders and plexopathies
- Disorders of Neuromuscular junction and skeletal muscle
- Congenital, traumatic and mechanical disorders
- Adverse effects of drugs on the Nervous System
- Somatoform disorders
- Paediatric Neurology

Learning Activities and Teaching Methods:

Lectures, Tutorials.

Assessment Methods:

Midterm Exam (35%) and Final Exam (65%). Assessment is by Single Best Answer MCQs (SBAs) and Short Answer Questions (SAQs).

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Pomerantz M. Andrew	Clinical Psychology: Science, Practice and Culture	Sage Publications 4 th Edition	2017	9781506386447
Drislane, Frank W.	Blueprints Neurology	Lippincott Williams and Wilkins 4 th Revised Edition	2013	9781451117684

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
	Step 1 Lecture Notes 2016 in Behavioral Sciences	Kaplan	2016	9781506208343
	Diagnostic and Statistical Manual of Mental Disorders	American Psychiatric Association 5th Edition (DSM5)	2013	9780890425558

Aminoff, Michael J.	Clinical Neurology	McGraw Hill/Lange 9th Edition	2015	9780071841429
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