# **Syllabus**

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| **Department:** | Psychology | | | |
| **Course:** | | | | Neuroscience III |
| **Professor:** | | Jorge Mario Andreau | | |
| **Year:** | | | 2018 | |

1. **Neuroscience III and Psychology:**

Neuroscience III is a four-month course belonging to the basic formation area of the Psychology Department. It is a mandatory course and belongs to the 2nd year of studies. It follows Neurosciences I, II courses.

It is closely related to Basic Cognitive Processes I, II, III y IV courses and Psychopathology course.

Neuroscience III reviews the biological mechanisms underlying many psychological functions (e.g., Memory, Language, Emotions, etc.). These contents are fundamental in order to understand human behavior and cognition. (normal or abnormal). This is why it is taught during the 2nd year of studies.

1. **Brief introduction of the course:**

Psychology was born as a science in 1879 with the creation of the Experimental Psychology Laboratory by Wilhelm Wundt. Therefore, Psychology detached from Philosophy because and became an independent science because it defined its own method and subject of study. The scientific and technological development made it possible to study many psychological functions scientifically.

Neurosciences are a group of disciplines, which share the same purpose: the study of the nervous system. In order to understand how cognition is created, psychologists must understand how all the previous levels (molecular, cellular, systemic and behavioral) works. This is why neurosciences is clearly important for future Psychologists.

1. **Purpose of Neurosciences III course:**

The main purposes of Neuroscience III are::

* Locate Psychology inside the group of disciplines contributing to Neuroscience knowledge.
* Study behavior, emotions and cognition from a neuroscience perspective.
* Build knowledge updated to the last researches on the subject.
* The study of many neuropsychological impairments and their neurological correlates (amnesia, aphasia, agnosia, apraxia, dementia, etc).

1. **Contents:**

**Lesson 1: REVIEW OF THE BASIC CONTENTS OF NEUROSCIENCES I**

**Contents:**

Definitions, history of neuroscience, a comprehensive introduction to the field of neuroscience and the basic principles of organization and function of the nervous system. An exploration of the neural basis of behavior at the cellular and systems levels will span the following topics: anatomy and development of the brain, cell biology, membrane potential, synaptic transmission, sensory and motor systems, and higher brain function (memory, language, etc.).

**References**

Pinel, J. *Biopsychology*. Ch. 3.

**Lesson 2: REVIEW OF THE BASIC CONTENTS OF NEUROSCIENCE II**

**Contents:**

Basic biological principles and processes involved in neural function, including the common architectural elements and functional processes of neurological systems, from the cellular/molecular to the organ system level. Integrative functions and behavior will be explored as well as developmental facets of neural function, neural plasticity and neuroendocrine functions.

**References**

Pinel, J. *Biopsychology*. Ch. 4.

**Lesson 3: ATTENTION AND CONSCIOUSNESS.**

**Contents:**

Definition, selective, sustained and divided attention. Controlled vs automatic processes. Attentional models. Posner attentional networks. Anatomical and physiological bases. Abnormal attention: neglect. Neuropsychological attention assessment (Trail Making Test). Consciousness, definition. New perspectives in the scientific study of conscious.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 4: EXECUTIVE FUNCTIONS.**

**Contents:**

Definition. Cognitive Models of Executive Functions. Frontal Syndromes, characteristics. Neurobiological Bases. Executive Functions assessment.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 5: LEARNING AND MEMORY.**

**Contents:**

Definition of Learning. Kind of learning (associative, non associative). Neurophysiology of learning and memory. Animal models. Memory systems. Definition of memory. Types of memories (declarative/non declarative). Neurobiological basis of memory as viewed from an integrative framework. Mechanisms of memory at cellular and molecular levels, through behavioral and physiological experimental studies, and in neuropsychological case studies.

**References**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 6: LANGUAGE**

**Contents:**

Language: Communication system. Hemispheric Lateralization. Language impairments: Aphasia.Definition and types:(Broca, Wernicke, global, conduction, etc.). Classic models. Language assessment.

**References**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 7: AGNOSIA AND APRAXIA.**

**Contents:**

Gnosia and recognition. Agnosia (visual, sensorial and auditive). Definition, types. Classic models. Assessment. Difference between sensorial impairment and gnosic impairments. Movement generation models. Apraxia. Definition, types. Classic models. Praxia assessment.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 8: NEUROSCIENCE AND INTELLIGENCE.**

**Contents:**

Definition of intelligence. Brief history of intelligence tests. Multiple intelligences. Practical and creative intelligence. Geniuses and mental retardation. .

Distributed brain networks and intelligence. White matter and intelligence.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 9: EMOTIONS AND STRESS.**

**Contents:**

Definition of stress. Stress response. Neuroendocrine system and the regulation of behavior in humans and animals. Interaction between brain structures and the endocrine system as related to stress responding. Example topics include neuroendocrine signaling pathways such as the hypothalamic-pituitary-adrenal axis. Amygdala and fear conditioning. Anxiety disorders. Depression and apathy.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 10: PSYCHOPHARMACOLOGY.**

**Contents:**

Neurobiological processes that underlie drug effects, addiction, treatment and relapse. Neural and physiological effects of the most commonly abused drugs at the cellular level. An introduction to basic pharmacology, including the pharmacodynamics and pharmacokinetics of the most highly abused drugs. Current research that is being performed in the neuroscientific community in the area of addiction, as our understanding of the brain and causes of addiction are continually changing as the technology used to examine neurobiology continually evolves.

**References:**

Bear, M., Paradiso, M., Connors, B.W. (2007) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins. Philadelphia.ISBN: 0-7817-6003-8

**Lesson 11: APPLIED NEUROSCIENCES.**

**Contents:**

Advancing integrative neuroscience, including novel applications such as neurofeedback (EEG, fMRI, NIRS), autonomic nervous system biofeedback, neuro-rehabilitation, brain-computer interface (BCI), transcranial magnetic stimulation (rTMS), virtual reality feedback, vagus nerve stimulation, electro-cranial stimulation, audio-visual stimulation, etc. Fostering education in applied neuroscientific techniques. Enhancing integrative practice in clinical treatment, education and optimal performance. Promoting evidence-based practice to optimize functions in both health and disease Increasing public knowledge of neuroscientific applications.

**References:**

Gazzaniga, M.. (2009) The Cognitive Neurosciences. Massachusetts Institute of Technology.ISBN 978-0-262-01341-3

**Lesson 12: NEUROSCIENCES OF FREE WILL.**

**Contents:**

Implications for our sense of agency, moral responsibility, and our understanding of consciousness in general. Clinical cases. Consequences on law and guilt. Is free will an illusion?

**References:**

Gazzaniga, M.. (2009) The Cognitive Neurosciences. Massachusetts Institute of Technology.ISBN 978-0-262-01341-3

1. **METHODOLOGICAL RESOURCES.**

Lessons have a duration of 3 hours per week. They consist of theoretical classes and practices based on the reading of cases, papers and news.

1. **EVALUATION:**

Students will be evaluated in three (3) ways: Two (2) written exams, and one (1) research work in collaboration with the research institute. Students who do not pass one or both exams have the chance to take them again one more time. Furthermore, an attendance of 75% is required to approve the curse.

Final examination will consist of an oral or written exam (multiple choice), or both.

1. **Neuroscience III Schedule**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Week** | **Lesson** | **Theory** | **Practice** | **Counseling** | **Evaluations** | **Research** |
| **1** | REVIEW OF THE BASIC CONTENTS OF NEUROSCIENCE I | **X** |  |  |  | **X** |
| **2** | REVIEW OF THE BASIC CONTENTS OF NEUROSCIENCE II | **X** |  |  |  | **X** |
| **3** | ATTENTION AND CONSCIOUSNESS. | **X** |  |  |  | **X** |
| **4** | EXECUTIVE FUNCTIONS.  LEARNING AND MEMORY. | **X** |  |  |  | **X** |
| **5** | LANGUAGE | **X** |  |  |  | **X** |
| **6** | AGNOSIA AND APRAXIA. | **X** |  |  |  | **X** |
| **7** | FIRST EXAM | **X** |  |  |  | **X** |
| **8** | NEUROSCIENCE AND INTELLIGENCE. |  |  |  | **X** |  |
| **9** | EMOTIONS AND STRESS | **X** |  |  |  | **X** |
| **10** | PSYCHOPHARMACOLOGY. | **X** |  |  |  | **X** |
| **11** | APPLIED NEUROSCIENCES. | **X** |  |  |  | **X** |
| **12** | SECOND EXAM | **X** |  |  |  | **X** |
| **13** | MAKE-UP EXAMS |  |  |  | **X** |  |
| **14** | NEUROSCIENCES OF FREE WILL | **X** |  |  |  |  |
| **15** | FINAL EXAMINATION |  |  |  | **X** |  |
| **16** | FINAL EXAMINATION |  |  |  | **X** |  |
| **17** | FINAL EXAMINATION |  |  |  | **X** |  |
| **18** | FINAL EXAMINATION |  |  |  | **X** |  |