

Teaching organization
**Euro-Mediterranean Master in Neuroscience and Biotechnology : Year 1**

YEAR	Semester	Name	Type	ECTS	Partner in charge	
	<b>1</b>	<b>Language and Communication</b>	Core Course	<b>3</b>	<b>All partners</b>	
		<b>Biotechnology and bioinformatics</b>	Core Course	<b>9</b>	<b>AU</b>	
		<b>Functional and cognitive anatomy</b> General presentation of cognitive functions, Neuroanatomy, cognitive and emotional connexions, animal behavioural models, animal vs human models	Core Course	<b>9</b>	<b>UV</b>	
		<b>Cellular neurobiology/physiology</b> synaptic connections, membrane excitability, action potential	Core Course	<b>9</b>	<b>All Partners</b>	
		<b>Total semester 1</b>		<b>30</b>		
	<b>2</b>	<b>Methodologies</b> Tutorials, Short training period, Practical workshop	Core Course	<b>6</b>	<b>All Partners</b>	
		<b>Experimental approaches of neuropathology</b> Neuropathology, Experimental models, Methods Mechanisms, Therapeutic strategies <i>Focus on Pain and Neurodegenerative disorders</i>	Core Course	<b>6</b>	<b>AMU UB</b>	
		<b>Behaviour, emotion and cognition</b> Language, consciousness, learning capacities, memory, motivation, stress and emotion	Core Course	<b>6</b>	<b>UB</b>	
		Elective courses : 2 teaching units (6 ECTS each) have to be chosen in the following list				
		<b>Biophysics</b>	<i>Elective Course</i>	<b>6</b>	<b>AU UCA</b>	
		<b>Neuropharmacology</b>	<i>Elective Course</i>	<b>6</b>	<b>UB</b>	
		<b>Case study in Biotechnology</b>	<i>Elective Course</i>	<b>6</b>	<b>UB UNITO</b>	
		<b>Developmental biology &amp; ageing</b>	<i>Elective Course</i>	<b>6</b>	<b>UNITO</b>	
	<b>Total semester 2</b>		<b>30</b>			

<b>Module</b>	<b>BIOINFORMATICS AND BIOTECHNOLOGY (FRENCH AND ENGLISH COURSES)</b>				
<b>Module coordinator</b>	<b>MOHAMED GAD</b>				
<b>Course name</b>	<b>BIOINFORMATICS AND BIOTECHNOLOGY / BIOINFORMATIQUE ET BIOTECHNOLOGIE</b>				
<b>Course teacher</b>	<b>MOHAMED GAD</b>			<b>ECTS</b>	
<b>Year</b>	<b>FIRST YEAR</b>			<b>9</b>	
<b>Semester</b>	<b>1</b>				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	135	<b>Tutored chat</b>	<b>Reports</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		9	32	47	47
<b>Course Description</b>	Bioinformatics is the field that deals with the analysis of the scientific information. In this module computer is the lab and softwares are the tools used in this lab. Learners deal with the information in the databases PubMed, nucleotides and proteins. They use bioinformatics tools to compare proteins and DNA sequences. They also use structure modeling to understand proteins structure-function relationship related to neurological diseases.				
<b>Aims and Outcomes</b>	<p>At the scientific information's level learners will be able to:</p> <ul style="list-style-type: none"> <li>•Navigate in the databases and analyze their information.</li> <li>•Construct protocols to carry out DNA to protein structure prediction tasks.</li> </ul> <p>At the transversal competences' level learners will be able to:</p> <ul style="list-style-type: none"> <li>•Evaluate the quality of their own work based on an evaluation network</li> <li>•Interpret his/her ideas in the form of protocols</li> <li>•Correlate what they read to what they write</li> </ul>				
<b>Course Structure</b>	<p>The module is entirely designed for elearning processes. In Elearning, the learner is the center of the learning process and carry out the majority of the learning activities.</p> <p>Module is composed of an introduction section, three learning sections and one final evaluation section.</p> <ul style="list-style-type: none"> <li>•Section 1 (module introduction) contains all the documents needed to understand the module enrolment.</li> <li>•Section 2 deals with databases. The section focuses on PubMed, DNA and proteins databases.</li> <li>•Section 3 deals with the analysis of DNA and proteins sequences using BLAST as alignment tool.</li> <li>•Section 4 deals with proteins structure prediction as a tool to understand proteins function.</li> <li>•Sections are sequential. Learners can not carry out tasks in section 3 without understanding the functionality in section 2 and so on. Late arrivals will have to do some effort to catch on with their colleagues.</li> <li>•Learners provide scientific reports with the results of their findings for each section</li> </ul> <p>Module course materials</p> <ol style="list-style-type: none"> <li>1. Some of the course materials are found on the platform. Learners have to search most of the needed information for the completion of the tasks in the corresponding scientific servers.</li> <li>2. Module sections and activities are distributed on 9 weeks period as can be seen in the module calendar.</li> <li>3. Weeks 1 and 2 are dedicated for taking an idea about the module construction and the activities that will be carried out. The learners are encouraged to see the activities in the sequences. A video conference session will be carried out to answer the learners questions.</li> <li>4. weeks 3-8 are for sections 2-4 activities. Two weeks for each section.</li> <li>5. Week 9 is dedicated for the white evaluation and the final module evaluation.</li> <li>6. During weeks 1 and 2, each learner will download and read course materials before beginning of the module activities to have a solid idea about the amount of work in the module. This will help later for the construction of the action plan.</li> </ol> <p>Action plan</p> <ol style="list-style-type: none"> <li>7. Action plan is the document in which all the activities that will be realised by the learner in a section and the time needed for each activity are cited. It is like a contract between learners and himself. Learners respect the time plan that they put for themselves without exceeding the time scheduled for each module section pre-determined by the module calendar. A model of an action plan is at the disposition of learners in the introduction section</li> </ol>				

#### Knowledge-evaluation tests

- 8.Learners will carry out the "knowledge-evaluation tests" which are several answered and commented question that helps in learning each section.
- 9.Learners can carry out these knowledge-evaluation tests as many times as they want.
- 10.The scores obtained in these tests are not taken into consideration in the module scoring but carrying out these tests is taken into consideration in the total module score.
- 11.Knowledge-evaluation tests represent the minimum information needed for better understanding of module's sections. The upper limit of knowledge is determined by the enthusiasm of the learners themselves. Module evaluation is limited to the minimum limit determined by the knowledge-evaluation tests.
12. Learners are encouraged to work in groups at their own organization to reduce task load.
13. For each section, each learner will provide asked reports individually.

#### Activity report

##### Nature of an activity report:

14. The first page of a report should contains your personal information and report title.
15. The reports pages should be numbered.
16. Report for section 2 is composed of 3 sections. These sections are,
17. Introduction, Materials and methods (m&m) and References. They are abbreviated as «IMR».
18. For reports of section 3 and 4, the results and discussion sections are considered. The data obtained from the case study and their interpretation are considered as the laboratory work. So for sections 3 and 4 the report is composed of Introduction, Materials and methods, Results, Discussion and references. They are abbreviated as "IMRAD".
19. Introduction section cover a presentation for the aim of the report and what will be presented in the following sections.
20. The m&m section covers the methodology used or studied in the task and presented in the report. In this section, the use of each component of the method should be presented.
21. The results section presents the data obtained from cas analysis.
22. The discussion section presents the interpretation of the data obtained in the results section.
23. The references section presents the scientific sources of the information presented in the report. A reference is considered as scientific when it is peer-reviewed. Scientific papers, text books, master's and Ph.D.'s theses are considered as scientific references.
24. Wikipedia is not a scientific source of information unless the information is mentioned in wikipedia with a scientific reference. In this case the scientific reference in wikipedia is used instead of wikipedia itself.
25. The use of wikipedia directly as a reference will result in the in-acceptance of your reports.

#### Report self-evaluation form

26. The report self-evaluation is found in each sequence.
27. It will be used by the learners themselves to evaluate their own report before the evaluation of the mentor. It will be submitted with each sequence activity report.
28. Delay in uploading asked documents in respect to module's sequence scheduled time will lead to loss of 5% of the score for each day of delay. This loss will be deduced from the score of the document(s)
29. A day begins and ends at midnight based on platform time.

#### White evaluation and final evaluation

30. At the end of the module the learners will have the opportunity to carry out a white module evaluation (WME).
31. WME It is a simulation of a typical final evaluation of the module except that the score of this white evaluation is not considered in the module total score.
32. A final module evaluation (FME) will be carried out at the end of the module.
33. WME and FME are based on case analysis gathering all the information studied during the module. You will be given a case and you will be asked to analyse this case with bioinformatics tools and answer the related evaluation questions.
34. Both WME and FME last for 2 hours and both need internet connection.
35. WME and FME are open book evaluations. Learners can assist these evaluations with their course materials.
36. The FME will follow each university roles. it will be carried out in your university computer unit under the total supervision of the local tutor.

#### General information

37. There will be one tutored chat per week, one chat for starting the module and another for closing of the module. During the rest of the time mentor can be contacted by the platform

	<p>mail.</p> <p>38.Mails sent by learners on mentor personal mail with tasks reports will not be taken into consideration.</p> <p>39.For each tutored chat there will be a meeting agenda which will be sent on the "news forum", found in the introduction section, before each tutored chat</p>
<b>Prerequisite</b>	DNA and proteins chemistry information
<b>Course Requirements</b>	Internet connection and access to scientific sites
<b>Required text</b>	
<b>Recommended Texts &amp; Other Readings</b>	Marco Biasini, Stefan Bienert, Andrew Waterhouse, Konstantin Arnold, Gabriel Studer, Tobias Schmidt , Florian Kiefer, Tiziano Gallo Cassarino, Martino Bertoni, Lorenza Bordoli, and Torsten Schwede. (2014) SWISS-MODEL: modelling protein tertiary and quaternary structure using evolutionary information. Nucl. Acids. Res. 12: 252-258
<b>Online Resources</b>	<p>NCBI home page: <a href="http://www.ncbi.nlm.nih.gov/guide/">http://www.ncbi.nlm.nih.gov/guide/</a></p> <p>NCBI Handbook: <a href="http://www.ncbi.nlm.nih.gov/books/NBK21101/">http://www.ncbi.nlm.nih.gov/books/NBK21101/</a></p> <p>NCBI on youtube: <a href="http://www.youtube.com/ncbinlm">http://www.youtube.com/ncbinlm</a> NCBI help manual: <a href="http://www.ncbi.nlm.nih.gov/books/NBK3831/">http://www.ncbi.nlm.nih.gov/books/NBK3831/</a></p> <p>Entrez help: <a href="http://www.ncbi.nlm.nih.gov/books/NBK3836/">http://www.ncbi.nlm.nih.gov/books/NBK3836/</a></p> <p>PubMed help: <a href="http://www.ncbi.nlm.nih.gov/books/NBK3830/">http://www.ncbi.nlm.nih.gov/books/NBK3830/</a>;</p> <p>BLAST help page:<a href="http://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&amp;PAGE_TYPE=BlastDocs">http://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&amp;PAGE_TYPE=BlastDocs</a></p> <p>BLAST handbook: <a href="http://www.ncbi.nlm.nih.gov/books/NBK21097/">http://www.ncbi.nlm.nih.gov/books/NBK21097/</a></p> <p>BLAST selection guide: <a href="http://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&amp;PAGE_TYPE=BlastDocs&amp;DOC_TYPE=ProgSelectionGuide">http://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&amp;PAGE_TYPE=BlastDocs&amp;DOC_TYPE=ProgSelectionGuide</a></p> <p>Blast home page: <a href="http://blast.ncbi.nlm.nih.gov/about/">http://blast.ncbi.nlm.nih.gov/about/</a></p> <p><a href="http://www.proteinstructures.com/index.html">http://www.proteinstructures.com/index.html</a></p> <p><a href="http://www.proteinstructures.com/Modeling/Modeling/modeling-tutorial-1.html">http://www.proteinstructures.com/Modeling/Modeling/modeling-tutorial-1.html</a></p> <p><a href="http://swissmodel.expasy.org/">http://swissmodel.expasy.org/</a></p> <p><a href="http://mordred.bioc.cam.ac.uk/~rapper/rampage.php">http://mordred.bioc.cam.ac.uk/~rapper/rampage.php</a></p>
<b>Evaluation and Grading</b>	<p>Knowledge evaluation test: 40 points: is to evaluate their capacity to Navigate in the databases and analyze their information. Correlate what they read to what they write</p> <p>Activity report and report self evaluatin form: 100 points: to evaluate their capacity to Interpret his/her ideas in the form of protocols Correlate what they read to what they write Evaluate the quality of their own work based on an evaluation network</p> <p>Final evaluation: 60 points: Construct protocols to carry out DNA to protein structure prediction tasks. Navigate in the databases and analyze their information.</p>

<b>Module</b>	FUNCTIONAL AND COGNITIVE ANATOMY				
<b>Module coordinator</b>	FRANCISCO OLUCHA BORDONAU				
<b>Course name</b>	FUNCTIONAL AND COGNITIVE ANATOMY				
<b>Course teacher</b>	FRANCISCO OLUCHA BORDONAU SAADIA BAMOHAMMED ENRIQUE LANUZA			<b>ECTS</b>	
<b>Year</b>	1ST			<b>9</b>	
<b>Semester</b>	1ST				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	225	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		12	12	16	185
<b>Course Description</b>	<p>The course is aimed at study the basic structure of the nervous system and the general connections between its components subserving neural function.</p> <p>General organization of the nervous system. general divisions of the nervous system. Information flow in the nervous system.</p> <p>Chemical neuroanatomy. glutamatergic systems, GABAergic, cholinergic, serotonergic, dopaminergic, noradrenergic, nitrergics, peptidergic.</p> <p>Somatosensory pathway. Receptors. somatosensory pathways anterolateral system and epicritic sensitivity</p> <p>Vestibular system and proprioception. Centers, roads. Cerebellum</p> <p>Auditory System. Cochlea. Auditory centers of the brainstem, thalamus and cortex. tonotopy</p> <p>Visual pathways. visual centers and representation of space in the retina, thalamus and cortex. Centers for eye movements</p> <p>Gustatory system and barorecepción. Receptors. Central pathways</p> <p>Olfactory systems. olfactory mucosa. olfactory tract</p> <p>Motor systems. Common motor final pathway. Extrapyramidal pathways</p> <p>Cognitive systems. Hippocampus, entorhinal cortex, neocortex. subcortical circuits and attention</p> <p>Emotional systems. Amygdala, prefrontal cortex, ventral striatum, thalamus nucleus accumbens and.</p> <p>Metabolic homeostatic systems. Circumventricular hypothalamic nuclei. Brainstem</p> <p>Circadian regulation systems. Circuits of the sleep-wake succession</p>				
<b>Aims and Outcomes</b>	<p>After course completion student has the knowledge about/knows how to/is able to...</p> <ol style="list-style-type: none"> <li>1. Demonstrate an understanding of the structural and functional organization of the nervous system and its relations with other systems.</li> <li>2. Obtain series of histological brain sections and application of conventional immunocytochemical techniques. The student will be able to mount a complete series of rat brain and apply a conventional histochemistry and immunocytochemistry techniques.</li> <li>3. Be able to define the major divisions of the brain in histological sections</li> </ol>				

	<p>4. Ability to assign a particular region or cerebral core to any of the functional systems</p> <p>5. Ability to discriminate subdivisions within a region based on the distribution of certain markers</p> <p>6. Organize information effectively in public exhibitions on functional systems</p> <p>7. Demonstrate ability to solve theoretical and related to the subject under study practical issues.</p>
<b>Course Structure</b>	<p>The course is organized in 6 tracks and each track is opened every week until completion of the course. For each track an opening session is delivered by videoconference in which a basic explanation of the topic is delivered. Also some documents are available for the students and a set of activities to work these basic concepts. The activities become closed at the end of each week and evaluated. At the end of the course a general evaluation process is delivered.</p>
<b>Prerequisite</b>	No prerequisites
<b>Course Requirements</b>	Internet connection
<b>Required text</b>	Documents are delivered in the platform
<b>Recommended Texts &amp; Other Readings</b>	<p>Neuroscience, Fifth Edition 5th Edition by Dale Purves Elsevier</p> <p>Principles of Neural Science, Fifth Edition (Principles of Neural Science (Kandel))</p> <p>Eric R. Kandel</p> <p>Fundamental Neuroscience for Basic and Clinical Applications: by Duane E. Haines</p>
<b>Online Resources</b>	<a href="http://www.e-masters.univ-bordeaux.fr/login/index.php">http://www.e-masters.univ-bordeaux.fr/login/index.php</a>
<b>Evaluation and Grading</b>	<p>50% of the grade is the final exam</p> <p>50% is the average of the activities along the course</p>

<b>Module</b>	<b>CELLULAR NEUROBIOLOGY AND PHYSIOLOGIE</b>				
<b>Module coordinator</b>	MARC LANDRY				
<b>Course name</b>	NEURONAL MORPHOLOGY NEUROTRANSMITTERS AND RECEPTORS BASIS OF NEURONAL EXCITABILITY				
<b>Course teacher</b>	MARC LANDRY ERIC HOSY			<b>ECTS</b>	
<b>Year</b>	1ST			<b>9</b>	
<b>Semester</b>	1ST				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	220	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		30	10		180
<b>Course Description</b>	<p>Neuronal cell types  Ultrastructural organisation of neuronal cells  Structure and function of the axon initial segment  Neuronal cytoskeleton and axonal transport  Synaptic organisation  Neuronal classifications  Glial cell types and functions  Basis of neurotransmitter classification  Receptor theory  Ligand-receptor interactions</p> <p>Principles of electro-diffusion  Resting potential  Action potential  Basis of neurotransmitter release</p>				
<b>Aims and Outcomes</b>	<p>Understand how a neuron is organized  Know and understand specific morpho-functional features of neurons  Know different neural cell types (neurons and glial cells)  Understand the concepts and mechanisms of neurotransmission  Understand the chemical principles of ion movements across the membrane  Understand the basis of neuronal excitability  Understand how an action potential is generated and propagates  Understand the main techniques used to probe cellular activity of neural cells (morphological approaches, cell cultures, electrophysiology, basis of biochemistry and molecular biology, basis on mutant animal models)  Analyse critically scientific publications of cellular neurobiology  Collect and organise data on a previously unknown topic</p>				
<b>Course Structure</b>	<p>Videoconferences  Recorded courses  Interactive activities on the Moodle platform (quiz, wiki, chat, forum)  Group work for article analysis  Group work and flipped classroom</p>				
<b>Prerequisite</b>	<p>Basis in cell biology (ultrastructural cellular organisation, intercellular communication,...),  Theoretical knowledge on common techniques to be performed in cell biology studies,  Practical knowledge of some techniques</p>				
<b>Course Requirements</b>	Access to the Master Moodle platform				

<b>Required text</b>	
<b>Recommended Texts &amp; Other Readings</b>	Principles of Neuroscience, Kandel et al. Neuroscience, Purves et al. Articles and reviews proposed in the dedicated course section on Moodle
<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)



<b>Module</b>	<b>EXPERIMENTAL APPROACHES IN NEUROPATHOLOGY</b>				
<b>Module coordinator</b>	<b>MARC LANDRY</b>				
<b>Course name</b>	<b>NEURODEGENERATIVE DISEASES PATHOPHYSIOLOGY OF PAIN BIOLOGICAL ASPECTS OF AGGRESSION</b>				
<b>Course teacher</b>	<b>MARC LANDRY NÓRA KEREKES CHRISTIAN GESTREAU</b>			<b>ECTS</b>	
<b>Year</b>	1ST			<b>6</b>	
<b>Semester</b>	2ND				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	153	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		25	8	0	120
<b>Course Description</b>	<p>General introduction to neurodegenerative diseases ( prevalence, common characteristics and causes potential risk and protective factors. Detailed pathophysiologies of Parkinson’s and Alzheimer diseases. Current view on neuroprotective strategies developed in research and clinic.</p> <p>General pathways of nociceptive transmission Animal models used to study nociception and chronic pain Physiological mechanisms of nociception in the periphery and in the spinal cord Pathological processes of pain sensitization Therapeutic approaches</p> <p>Presentation of antisocial aggressive behaviour Details of the complex network of neuroanatomical, neurochemical, genetic, physiological and psychological correlates of human behaviours Neurological and psychological aspects of self-control/self-governance Philosophical concept of free-will versus determinism</p>				
<b>Aims and Outcomes</b>	<p>Understand the neurobiological and molecular correlates of neurological disorders, especially in neurodegenerative diseases and chronic pain Understand preclinical research in the field of neurological disorders Integrate new data from the literature to the state of the art picture of neurological disorders Acquire capacity to build a personal view on relationships between pathophysiological processes in neurons and clinical expression of neurodegenerative diseases. Understand neuroanatomical and neurochemical basis of aggression Understand psychological characteristics that coupled to antisocial behaviour. Couple the results of up to date molecular and quantitative genetic research to antisocial aggression as a phenotype, Understand holistic diagnostic and treatment strategies in the field of Neurological disorders.</p>				
<b>Course Structure</b>	<p>Videoconferences Recorded courses Interactive activities on the Moodle platform (quiz, wiki, chat, forum) Group work for article analysis Group work and flipped classroom</p>				
<b>Prerequisite</b>	<p>Basis on cellular neurobiology Notions of physiology and neuroanatomy</p>				
<b>Course Requirements</b>	<p>Access to the Master Moodle platform</p>				

<b>Required text</b>	
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle
<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)

<b>Module</b>	<b>BEHAVIOR, EMOTION, COGNITION</b>				
<b>Module coordinator</b>	<b>ROSE-MARIE VOUIMBA</b>				
<b>Course name</b>	<b>NEUROBIOLOGY OF EMOTION AND COGNITION</b>				
<b>Course teacher</b>	<b>ROSE-MARIE VOUIMBA</b>			<b>ECTS</b>	
<b>Year</b>	1 <sup>ST</sup>			<b>6</b>	
<b>Semester</b>	2 <sup>ND</sup>				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	36	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		4 (in visioconference)	NA	NA	At least 32
<b>Course Description</b>	This course is divided in 3 main chapters. The first one provides an overview of past and current theories of emotion. It discusses the biological substrates of two emotions (pleasure and fear) and pathologies (such as addiction and phobias) related to dysfunctions in these substrates. The second chapter highlights the neural mechanisms underlying cognitive functions such as attention, perception, visual recognition and memory. This chapter focus include how brain damage affects these functions and how patients with brain lesions can contribute to our understanding of the normal brain. The third chapter, focuses on the importance of the interplay between emotion and cognition. It discusses on how emotion influences cognition and how cognitive processes can have emotional consequences, with an overview of the underlying mechanism of such an interaction.				
<b>Aims and Outcomes</b>	This course allows students to strengthen their integrated approach of higher mental functions. Students will learn how to address pathophysiological issues, relative to psychiatric and neurological disorders, from basic research in neuroscience.				
<b>Course Structure</b>	The course will be delivered online, and will be accompanied by 2 Video conference lectures introducing the different chapters.				
<b>Prerequisite</b>	Prior knowledge on brain neuroanatomical substrates and their organizations (especially the structures of the limbic system and cortical structures) and on chemical substrates of the brain (neurotransmitters, neuromodulators and neuro-hormones) will help in a better understanding of the course.				
<b>Course Requirements</b>	Internet connection				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>					
<b>Online Resources</b>					
<b>Evaluation and Grading</b>	The final grade is based on a written exam (75%) and online assessments (25%).				

<b>Module</b>	NEUROPHARMACOLOGY				
<b>Module coordinator</b>	PHILIPPE DE DEURWAERDÈRE				
<b>Course name</b>	NEUROPHARMACOLOGY				
<b>Course teacher</b>	PHILIPPE DE DEURWAERDÈRE			<b>ECTS</b>	
<b>Year</b>	1ST			<b>6</b>	
<b>Semester</b>	2ND				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	38	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		16	22	na	60
<b>Course Description</b>	The objective of the Neuropharmacology unit is to give the knowledge and a scientific background sufficient to understand the orientations or the pharmaceutical options for the treatment of various pathologies of the CNS. The overall course will present most classes of CNS medicines and the targeted neurotransmission systems. A large part will be dedicated to the methodologies to get and present the information. Students will be also actors of their knowledge.				
<b>Aims and Outcomes</b>	At the end, students should have developed automatisms in Neuropharmacology (Kd, Ki, Km, IC50, EC50, agonist, antagonist, inverse agonist, inhibitors, efficacy) applied to targets of neurotransmitter systems. They should identify a class of medicine and pharmacological agents. They should know to what kind of neurotransmitter systems a medicine is designed for.				
<b>Course Structure</b>	<p>A core teaching will present the pharmacological basics for pharmacodynamic studies. A core course will present the neuropharmacological basis of some classes of medicines (antipsychotics, antidepressant drugs) covering also the physiology and the pathophysiology of some neurotransmitter systems. Other classes of medicines will be studied by the students with the help of the teachers. Pharmacokinetics will be also discussed through works done by students.</p> <p>Thus, groups of 2 students will have to elaborate presentations for a neurotransmitter system and its pharmacological targets in front of the other students. In addition, students will have punctual works specifically on one medicine, a concept in pharmacology, a receptor or an enzyme (example: H3 receptors; Catechol-O-methyl transferase, Cytochrome P450 2D6, biased agonism, fentanyl, Cheng and Prussoff...).</p> <p>Courses and works done by the students and the teachers will be available on the platform.</p>				
<b>Prerequisite</b>	none				
<b>Course Requirements</b>	Internet connection/access to specified recourses or web sites. The lectures and oral presentations are given by video conference.				
<b>Required text</b>	No				
<b>Recommended Texts &amp; Other Readings</b>	Psychopharmacology (Drugs, the brain and Behavior) – JS Meyers and LF Quenzer (Sinauer Edition)				

<b>Online Resources</b>	
<b>Evaluation and Grading</b>	Homework: 50% (works on pharmacological target and neurotransmitter systems + oral presentation) Exam: 50% (3 hours with 2 parts: a dissertation and exercises)

<b>Module</b>					
<b>Module coordinator</b>	Alexandre FAVEREAUX				
<b>Course name</b>	CASE STUDY IN BIOTECHNOLOGY				
<b>Course teacher</b>	Alexandre FAVEREAUX			<b>ECTS</b>	
<b>Year</b>	1 <sup>st</sup>			<b>6</b>	
<b>Semester</b>	2 <sup>nd</sup>				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	150	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		12	---	---	138
<b>Course Description</b>	<p>This course is designed to develop critical thinking and experimental design skills in the specific context of cell and molecular neurosciences. You will use previous learning in new and concrete situation. Case study articles will be discussed to support the experimental design project that will be required. Experimental approaches discussed will include: reverse genetics, RNA interference, site directed mutagenesis, fusion proteins, expression vectors, immunolocalization; protein-protein interactions (immunoprecipitation, pull- down, two-hybrid, energy transfer, dominant negative).</p>				
<b>Aims and Outcomes</b>	<p>This course is aimed to acquire on desk skills necessary for experimental plan  After studying this course, you should be able to:  Analyze and decode “materials and methods” from case study articles. Propose appropriate in vitro experimental approaches to concrete situation  Design experiments to reproduce published results  Use collaborative instruments for group work  Communicate using proper scientific terms and presentation</p>				
<b>Course Structure</b>	<p>The course is structured as flipped classroom in which short video lectures and support materials are viewed by students at home before the videoconference class sessions which are devoted to questions, exercises and discussions.  Specific individual and group activities including participation to chat and forum, quiz, assays and projects will be submitted by students over scheduled deadlines.</p>				
<b>Prerequisite</b>	Cellular neurobiology, biotechnology and bioinformatics, recombinant DNA methodologies				
<b>Course Requirements</b>	Internet connection, google account and “socrative student” app				
<b>Required text</b>	None				
<b>Recommended Texts &amp; Other Readings</b>	Advanced molecular and cell biology text books				
<b>Online Resources</b>	NCBI resources				
<b>Evaluation and Grading</b>	Evaluation is based on: continuous individual activities submitted during the course (20%); group experimental design project (30%) and individual final exam (30%). The final exam is based on material covered in lectures, assignments, readings and other online activities.				

<b>Module</b>					
<b>Module coordinator</b>	SILVIA DE MARCHIS				
<b>Course name</b>	DEVELOPMENTAL NEUROBIOLOGY				
<b>Course teacher</b>	SILVIA DE MARCHIS AND ISABELLE PERROTEAU			<b>ECTS</b>	
<b>Year</b>	1ST			6	
<b>Semester</b>	2ND				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	150	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		16	---	---	134
<b>Course Description</b>	The course will deal with basic principles of developmental neurobiology, including neural induction, neural patterning, neural stem cells, neurogenesis and gliogenesis, neural migration, differentiation, axonal growth and guidance, synaptogenesis and plasticity. Neural developmental processes will be also discussed in terms of their relevance in the context of neural regeneration and recovery of function following disease and injury. The course focuses on the use of different animal models (both invertebrates and vertebrates) and different experimental approaches (e.g. transgenic models, cell transplantation approaches, organotypic/cell culture) as discovery tools to investigate the fundamental principles of CNS development.				
<b>Aims and Outcomes</b>	Develop knowledge on the main principles and experimental models in Developmental Neurobiology. On successful completion of the course students should be able to: describe the main model organisms and experimental approaches used in the field describe the main principles and cellular/molecular events in CNS development understand specialized seminars in the field; discuss scientific papers in the field; to figure out the appropriate methodological framework to address a scientific question in the field.				
<b>Course Structure</b>	The course will be organized in Topics organized as detailed below: 1- key-notes that establish the main underlying theme and/or a recorded lectures (ppt presentations with audio commentary) 2- support material to deepen the knowledge of the topic (i.e. reference to specific book chapters available on-line - link to websites) 3- student's activities that can involve different tasks (e.g a paper to discuss, problem solving, self-evaluation quiz) depending on the topic. Reports of activities will be submitted by students over scheduled deadlines. 4. chat sessions to directly interact with teachers/tutors and discuss specific themes related to the topics				
<b>Prerequisite</b>	Basic knowledges of developmental biology and cell/molecular biology of the nervous system.				
<b>Course Requirements</b>	Internet connection				
<b>Required text</b>	None				
<b>Recommended Texts &amp; Other Readings</b>	Development of the Nervous System – Dan H. Sanes Thomas A. Reh William A. Harris – 3rd Edition – Elsevier Developmental Biology, Thent Edition Scott F. Gilbert - Sinauer Associates, Incorporated, 2013				
<b>Online Resources</b>	<a href="http://php.med.unsw.edu.au/embryology/index.php?title=Neural_System_Development">http://php.med.unsw.edu.au/embryology/index.php?title=Neural_System_Development</a> <a href="http://www.ncbi.nlm.nih.gov/books/NBK9983/">http://www.ncbi.nlm.nih.gov/books/NBK9983/</a>				

<b>Evaluation and Grading</b>	Students evaluation is based on continuous evaluations of the task submitted during the course (50%) and on a final exam (50%) based on material covered in lectures, assigned readings, and online activities.
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**Euro-Mediterranean Master in Neuroscience and Biotechnology: Year 2**

YEAR	Semester	Name	Type	ECTS	Partner	
2	3	<b>Economy</b> Intellectual property, Patent, Quality procedures, Biotechnology and Regional Economy	Core Course	3	U. Saint Esprit de Kaslik	
		<b>Regulations, laws and Bioethics</b> Public policy, Laws on ethics, Animal experimentation, Biosafety	Core Course	3	U. Tunis-El Manar	
		<b>Drug development</b> Procedures for drug approval, Economical aspects	Core Course	3	Christian Mésenge	
		Elective courses: one specialization track, made of 3-4 teaching units, must be chosen from the following 3 options:				
		<b><u>Track 1 - Molecular and cellular Neuroscience</u></b>				
		<b><i>Plasticity and cell communication</i></b> Synaptic plasticity, Neuron-glia interaction, Membrane receptors, Trafficking	Elective Course	9	U. Bordeaux U. Nice	
		<b><i>Neurogenesis, Stem cells and transplantation</i></b> Neural progenitors, Migration, Differentiation, Apoptosis	Elective Course	6	U. Alexandria	
		<b><i>Case study in Biotechnology</i></b> To propose a strategy for answering a biological question, or for constructing a specific tool	Elective Course	6	JU. Krakow	
		<b><u>Track 2 - Integrative and system biology</u></b>				
		<b><i>From sensation to perception</i></b> Focus on 2 main examples: Somatosensory and Visual perception (Transduction, coding, elaboration of the sensation, representation, integration).	Elective Course	6	U. Valencia/ U. Cadi Ayyad de Marrakesh	
		<b><i>From perception to action</i></b> Neuronal pathways: Cortex, subcortical pathways, spinal cord, effectors	Elective Course	6	U. Aix-Marseille	
		<b><i>Integrative physiology</i></b> Focus on biological Rhythms	Elective Course	6	U. Strasbourg	
		<b><i>Computational neuroscience and neural network</i></b>	Elective Course	3	U. Aix-Marseille	
<b><u>Track 3 - Neuropathology, Neuroprotection and Clinical Neurosciences</u></b>						
<b><i>Neuroimmunogenetics and Inflammatory Disorders</i></b> <i>Nervous and immune system interactions</i> <i>Neurogenetics and Neuroepigenetics of brain disorders</i> <i>Neuron-Glia interaction: Implications in</i>	Elective Course	9	U. Tunis-El Manar			

		<i>neuroinflammation</i>			
		<b>Neuroprotection and Therapeutic Approaches</b> Biochemical and molecular mitochondrial disorders Microbiome, microbiota, probiotics and neurodegenerative diseases Neuropeptides and neuronal survival	Elective Course	<b>6</b>	<b>U. Tunis-El Manar</b>
		<b>Clinical Neuroscience</b> <i>Neurocognitive impairment</i> <i>Neurodegenerative diseases</i>	Elective Course	<b>6</b>	<b>U. Tunis-El Manar</b>
		<b>Clinical Neurophysiology</b> Clinical neurophysiology in neuromuscular diseases Clinical neurophysiology in central nervous system disorders	Elective Course	<b>3</b>	<b>U. Tunis-El Manar</b>
		<b>Total Semester 3 (Core + Elective)</b>		<b>30</b>	
<b>2</b>	<b>4</b>	<b>Long Training Period (Internship)</b>		<b>30</b>	<b>All Partners</b>
		<b>Total Semester 4</b>		<b>30</b>	
<b>TOTAL YEAR 1 AND 2</b>				<b>120</b>	

<b>Module</b>	<b>ECONOMY</b>			
<b>Module coordinator</b>	<b>JEAN TAMRAZ</b>			
<b>Course name</b>				
<b>Course teacher</b>	CAROLE DOUEIRY-VERNE, LEONEL MATAR, JEAN TAMRAZ			<b>ECTS</b>
<b>Year</b>	2ND			<b>3</b>
<b>Semester</b>	3RD			
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>		
	94	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>
		12 hrs	7 hrs	
			<b>Personal work</b>	75 hrs
<b>Course Description</b>	<p><b>Section 1</b> European Research Area: strategy and perspectives (J. TAMRAZ – USJ)</p> <p><b>Section 2</b> The current challenges of globalization (L. MATAR - USJ)</p> <p><b>Section 3</b> Globalization, innovation and sustainable development (L. MATAR - USJ)</p> <p><b>Section 4</b> Biotechnology and Research (L. MATAR - USJ)</p> <p><b>Section 5</b> Management of research and innovation (J. TAMRAZ - USJ)</p> <p><b>Section 6</b> Biotechnology Watch : Impact on health and social benefits (J. TAMRAZ - USJ)</p> <p><b>Section 7</b> Business Ethics &amp; Corruption - 1 &amp; 2 - (C. DOUEIRY-VERNE - USJ)</p>			
<b>Aims and Outcomes</b>	After course completion student should improve their knowledge regarding the international economic environment in the light of the globalization. In order to be competitive students should be aware of the business issue and research management, taking into consideration the ethics aspects.			
<b>Course Structure</b>	The course is delivered face to face using lectures including interactive tasks			
<b>Prerequisite</b>	Completed courses: basic sciences (Licence in biological science and/or medicine or pharmacy first 3 yrs completed at least)			
<b>Course Requirements</b>	Internet connection, video projection			
<b>Required text</b>	Conference slides and related material			
<b>Recommended Texts &amp; Other Readings</b>	Specific or review articles and reference books are proposed			
<b>Online Resources</b>	Dedicated moodle plateform (Bordeaux)			
<b>Evaluation and Grading</b>	Final exam on the moodle platform, including QCM and QROCM questions			

<b>Module</b>	<b>REGULATIONS, LAWS AND BIOETHICS</b>				
<b>Module coordinator</b>	<b>JEAN TAMRAZ</b>				
<b>Course name</b>					
<b>Course teacher</b>	TATYANA NOVOSSIOLOVA, SAMI RICHA, MICHEL SCHEUER, JEAN TAMRAZ			<b>ECTS</b>	
<b>Year</b>	2ND			<b>3</b>	
<b>Semester</b>	3RD				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	94	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		12 hrs	7 hrs		75 hrs
<b>Course Description</b>	<p><b>Section 1</b> Ethics of research involving Human beings and freedom of the researcher (M. SCHEUER - USJ)</p> <p><b>Section 2</b> Biomedical &amp; Health research: Ethics &amp; Principle of precaution (J. TAMRAZ - USJ)</p> <p><b>Section 3</b> Neuroimaging: ethical issues and medicolegal aspects (J. TAMRAZ - USJ)</p> <p><b>Section 4</b> Communication with patient's families suffering from mental diseases (S. RICHA - USJ)</p> <p><b>Section 5</b> Introduction to Biosecurity and Dual use (T. Novossiolova - LNCV)</p> <p><b>Section 6</b> Military Applications of Neuroscience: Past, Present and Future (T. Novossiolova LNCV)</p> <p><b>Section 7</b> The CBW Non-Proliferation regime (T. Novossiolova - LNCV)</p>				
<b>Aims and Outcomes</b>	Student should take into consideration major present ethical issues in neuroscience				
<b>Course Structure</b>	The course is delivered presentially using lectures including interactive tasks				
<b>Prerequisite</b>	Completed courses: basic sciences (Licence in biological science and/or medicine or pharmacy first 3 yrs completed at least)				
<b>Course Requirements</b>	Internet connection, video projection				
<b>Required text</b>	Conference slides and related material				
<b>Recommended Texts &amp; Other Readings</b>	Specific or review articles and reference books are proposed				

<b>Online Resources</b>	Dedicated moodle platform (Bordeaux)
<b>Evaluation and Grading</b>	Final exam on the moodle platform, including QCM and QROCM questions

<b>Module</b>	<b>DRUG DEVELOPMENT</b>				
<b>Module coordinator</b>	<b>CHRISTIAN MESENGE &amp; MOHAMED GAD</b>				
<b>Course name</b>	<b>DRUG DEVELOPMENT</b>				
<b>Course teacher</b>	<b>CHRISTIAN MESENGE &amp; MOHAMED GAD</b>			<b>ECTS</b>	
<b>Year</b>	2ND			<b>3</b>	
<b>Semester</b>	3RD				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	75	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		15	5	10	45
<b>Course Description</b>	Drug development process: from preclinical research to drug registration, bioethics in clinical research and pharmacovigilance				
<b>Aims and Outcomes</b>	After course completion student is able to understand the different phases of the drug development, good clinical practices, bioethic issues with clinical research. The student understands the place of the pharmaceutical industry in the international economy and the possible roles (jobs) offered in the pharmaceutical industry.				
<b>Course Structure</b>	The course is available on line in French and in English. Two seminars in videoconference. The students must prepare a clinical research protocol on an imaginary but scientifically sounded drug on a neurological condition and present it as a team work.				
<b>Prerequisite</b>	NA				
<b>Course Requirements</b>	Internet connection and if possible access to a videoconference platform				
<b>Required text</b>	For this rapidly evolving field we mainly use on line resources				
<b>Recommended Texts &amp; Other Readings</b>	For this rapidly evolving field we mainly use on line resources				
<b>Online Resources</b>	<a href="http://www.e-masters.univ-bordeaux.fr/pluginfile.php/4953/mod_resource/content/1/RD_Brochure_2013.pdf">http://www.e-masters.univ-bordeaux.fr/pluginfile.php/4953/mod_resource/content/1/RD_Brochure_2013.pdf</a> <a href="http://www.fda.gov/ScienceResearch/SpecialTopics/RunningClinicalTrials/ucm134476.htm">http://www.fda.gov/ScienceResearch/SpecialTopics/RunningClinicalTrials/ucm134476.htm</a> <a href="https://www.swissmedic.ch/zulassungen/00153/index.html?lang=fr">https://www.swissmedic.ch/zulassungen/00153/index.html?lang=fr</a> <a href="http://europa.eu/about-eu/agencies/regulatory_agencies_bodies/policy_agencies/ema/index_fr.htm">http://europa.eu/about-eu/agencies/regulatory_agencies_bodies/policy_agencies/ema/index_fr.htm</a> <a href="http://ansm.sante.fr/">http://ansm.sante.fr/</a>				
<b>Evaluation and Grading</b>	Team work Each clinical research team of students has to prepare a protocol of clinical research. They have to work as a project team. They are requested to present the protocol as a PowerPoint presentation, to discuss critical point with an ethic committee (made by other students) and finally answer general question from the professor. Criteria of evaluation: -Rational of the proposed study -Relevance of the proposed disease (epidemiology) - Quality of the slides - Quality of the presentation -Answers to the questions (on all the aspects of the courses of drug development)				

<b>Module</b>	<b>PLASTICITY &amp; CELL COMMUNICATION</b>				
<b>Module coordinator</b>	MARC LANDRY				
<b>Course name</b>	RECEPTORS, TRANSDUCTION, SIGNALLING GLIAL CELLS AND GLIOTRANSMISSION SYNAPTIC PLASTICITY				
<b>Course teacher</b>	MARC LANDRY PASCAL FOSSAT JACQUES NOËL SHERINE ABDEL SALAM KARINE MASSE			<b>ECTS</b>	
<b>Year</b>	2ND			<b>9</b>	
<b>Semester</b>	3RD (TRACK 1: CELLULAR AND MOLECULAR NEUROSCIENCE)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	226	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work (including e-learning)</b>
		40	6		180
<b>Course Description</b>	Introduction to Neuronal plasticity G-protein coupled receptors Growth factors and tyrosine kinase receptors Ionotropic receptors and their trafficking Purinergic signalling Cytoskeleton-associated signalling Glial cells and repertoire of gliotransmitters Astrocyte activation Astrocyte and synaptic transmission Astrocytes and synaptic memory Molecular mechanisms of synaptic plasticity, long-term potentiation and long-term depression				
<b>Aims and Outcomes</b>	Understand molecular mechanisms of neurotransmission and gliotransmission Have an overview on intracellular signalling Understand molecular mechanisms of synaptic plasticity Develop a critical analysis of complex data sets on neurotransmission Propose experimental strategy to tackle questions related to neurotransmission				
<b>Course Structure</b>	Videoconferences Recorded courses Interactive activities on the Moodle platform (quiz, wiki, chat, forum) Group work for article analysis Group work and flipped classroom				
<b>Prerequisite</b>	Master 1, basics in cellular neurobiology				
<b>Course Requirements</b>	Access to the Master Moodle platform				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle				

<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Method of calculating the final grade/method of learning outcomes verification



<b>Module</b>	<b>TRACK ONE – MOLECULAR – EMN (EX-ISIS) MASTER PROGRAM</b>				
<b>Module coordinator</b>	<b>PROF. AHMAD RAAFAT BASSIOUNY</b>				
<b>Course name</b>	<b>NEUROGENESIS, STEM CELL &amp; TRANSPLANTATION</b>				
<b>Course teacher</b>	<b>PROF. AHMAD RAAFAT BASSIOUNY</b>			<b>ECTS</b>	
<b>Year</b>	2			6	
<b>Semester</b>	3 (TRACK 1)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	130	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		weekly		NO	Assigned presentation
<b>Course Description</b>	Students will be exposed to the discovery of Adult Neurogenesis. Neural stem cells, neurogenesis in adult olfactory system, adult hippocampal neurogenesis, regulation and function of neurogenesis, applications of neurogenesis in medicine.				
<b>Aims and Outcomes</b>	To obtain an advance understanding of neurogenesis in the adults. Students are expected to acquire knowledge and understanding of the basic biology of embryonic and tissue-specific stem cells, the potential application of stem cell for the treatment of human diseases.				
<b>Course Structure</b>	Details of how the course will be delivered: lectures/practical course/seminars/lab work/Realization of independently performed tasks by student etc.				
<b>Prerequisite</b>	Undergraduate completed biology courses- graduate student				
<b>Course Requirements</b>	Internet connection/access to specified recourses or web sites etc.				
<b>Required text</b>	Research articles; lecture notes; powerpoint presentations;				
<b>Recommended Texts &amp; Other Readings</b>	1. Research articles; lecture notes; powerpoint presentations; 2. Adult Neurogenesis; G. Kempermann, OUP; ISBN: 978-019-517971-2				
<b>Online Resources</b>	1: Lecture, 2: Question-Answer, 3: Case-study				
<b>Evaluation and Grading</b>	Student Presentations and 1 Final				

<b>Module</b>	NEUROENDOCRINOLOGY AND NEUROBIOLOGY OF FOOD INTAKE				
<b>Module coordinator</b>	ANNA BLASIAK				
<b>Course name</b>	NEUROENDOCRINOLOGY AND NEUROBIOLOGY OF FOOD INTAKE				
<b>Course teacher</b>	ANNA BLASIAK			<b>ECTS</b>	
<b>Year</b>	2			6	
<b>Semester</b>	3 / TRACK 1				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	150	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		25	5	0	120
<b>Course Description</b>	<p>Basics of Neuroendocrinology          Neuropeptidergic transmission          Hypothalamic regulations          Example of an integrated neuroendocrine regulation: the control of food intake</p> <ul style="list-style-type: none"> <li>• CNS Control of Food Intake and Energy Balance</li> <li>• Metabolic Signals in the Control of Food Intake</li> <li>• Gastrointestinal Signaling in the Control of Food Intake</li> <li>• Interactions Between Enteric Microbiota, Central and Enteric Nervous Systems</li> <li>• Rewarding and Motivating Effects of Food</li> <li>• Stress and Food Intake</li> <li>• Food Intake Disorders</li> </ul>				
<b>Aims and Outcomes</b>	<p>After course completion student :</p> <ul style="list-style-type: none"> <li>• Has the knowledge of neuropeptide synthesis, transport, secretion and mechanisms of action</li> <li>• Has a general representation of neuroendocrine functions</li> <li>• Knows hypothalamic functions</li> <li>• Has the knowledge about neuronal control of food intake.</li> <li>• Knows brain circuits and neurotransmitters involved in reward based food intake.</li> <li>• Understand different role and origin of homeostatic and 'emergency response circuits' in the control of feeding.</li> <li>• Is able to describe major causes of food intake disorders, their neurobiological underpinnings and accepted treatments.</li> </ul>				
<b>Course Structure</b>	Videoconferences Recorded courses Group work for article analysis Group work and flipped classroom				
<b>Prerequisite</b>	Basics of neurophysiology and cellular neurobiology				
<b>Course Requirements</b>	Internet connection				
<b>Required text</b>	Required resources will be made available during the course duration				
<b>Recommended Texts &amp; Other Readings</b>	Relevant manuscripts, opinion articles and reviews will be proposed in the dedicated course section on Moodle				
<b>Online Resources</b>	Dedicated Moodle platform				
<b>Evaluation and Grading</b>	Continuous evaluation : article presentation and/or quizz (40%) Final exam (60%)				

<b>Module</b>	FUNCTIONAL AND INTEGRATIVE NEUROSCIENCE				
<b>Module coordinator</b>	FRANCISCO OLUCHA BORDONAU				
<b>Course name</b>	FROM SENSATION TO PERCEPTION				
<b>Course teacher</b>	FRANCISCO OLUCHA BORDONAU SAADIA BAMOHAMMED MOHAMMED BENNIS CARMINA MONTOLIU JULIO SANJUAN				<b>ECTS</b>
<b>Year</b>	2ND				<b>6</b>
<b>Semester</b>	1ST				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	150	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		7	7	10	126
<b>Course Description</b>	<p>The course is aimed at study the processing of incoming information from where it is produced, the sensory organs to where it is perceived and emotionally coloured (the cortical level).  Basic processing of sensory information will be studied on the following topics  Transduction  Coding  Elaboration  Representation  Emotion and memory  Hallucination</p>				
<b>Aims and Outcomes</b>	<p>Students will learn  1) the basic processes of sensory elaboration common to different modalities  2) the basic mechanisms of processing  3) to differentiate each process at each step  4) to identify the structures in which processing is taking place</p>				
<b>Course Structure</b>	<p>The course is organized in 6 tracks and each track is opened every week until completion of the course. For each tract an opening session is delivered by visioconference in which a basic explanation of the topic is delivered. Also some documents are available for the students and a set of activities to work these basic concepts. The activities are closed at the end of each week and evaluated.  At the end of the course a general evaluation process is delivered.</p>				
<b>Prerequisite</b>	No prerequisites				
<b>Course Requirements</b>	Internet connection				
<b>Required text</b>	Documents are delivered in the plateforme				
<b>Recommended Texts &amp; Other Readings</b>	<p>Neuroscience, Fifth Edition 5th Edition by Dale Purves Elsevier  Principles of Neural Science, Fifth Edition (Principles of Neural Science (Kandel))  Eric R. Kandel  Fundamental Neuroscience for Basic and Clinical Applications: by Duane E. Haines</p>				

<b>Online Resources</b>	<a href="http://www.e-masters.univ-bordeaux.fr/login/index.php">http://www.e-masters.univ-bordeaux.fr/login/index.php</a>
<b>Evaluation and Grading</b>	50% of the grade is the final exam 50% is the average of the activities along the course

<b>Module</b>	<b>FROM PERCEPTION TO ACTION</b>				
<b>Module coordinator</b>	<b>LAURENCE CASINI (AMU)</b>				
<b>Course name</b>	<b>FROM PERCEPTION TO ACTION</b>				
<b>Course teacher</b>	<b>LAURENCE CASINI (AMU), DRISS BOUSSAOU (AMU), FRANCK VIDAL (AMU)</b>			<b>ECTS</b>	
<b>Year</b>	<b>MASTER 2 (2<sup>ND</sup> YEAR)</b>			<b>6</b>	
<b>Semester</b>	<b>3</b>				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	120	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		30		10	90
<b>Course Description</b>	<p>This course is about how we control our actions in response to stimuli. It contains :</p> <ul style="list-style-type: none"> <li>-1/ the presentation of the brain circuits of action planning and execution</li> <li>-2/ the brain mechanisms of sensori-motor learning, neuroplasticity and neuro-repair</li> <li>-3/ mechanisms and neural basis controlling decision</li> <li>-4/ mechanisms and neural basis of action monitoring</li> </ul>				
<b>Aims and Outcomes</b>	<p>After course completion student has the knowledge about brain mechanisms of sensori-motor learning and neural basis of processes linking stimuli to actions. They know the difference between motor planning, motor program and motor execution. They are able to define processes involved in response decision for automatic stimulus-response associations versus controlled stimulus-response associations, as well as to define processes involved in reactive versus proactive action monitoring. They are able to illustrate their knowledge from data coming from different brain imagery technics and also from neural pathologies.</p>				
<b>Course Structure</b>	<p>Course will be delivered through lectures given by video-conferences and written documents available on the "moodle" platform. One practical work will also be required as well as analyses of scientific articles given by teachers.</p>				
<b>Prerequisite</b>	<i>Completed courses/ Animal Experiment Licence etc.</i>				
<b>Course Requirements</b>	Internet connection and access to the ISIS platform is necessary.				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Several scientific articles will be given by teachers during the course.				
<b>Online Resources</b>					
<b>Evaluation and Grading</b>	<p>Students will be required to perform several pieces of homework (at least 3) including analysis of articles and answers to questions about the lectures. In addition, they will have to carry out practical work. They will obtain a grade for each piece of work and the final grade will be a weighted average of these grades.</p>				

<b>Module</b>	<b>INTEGRATIVE PHYSIOLOGY, FOCUS ON BIOLOGICAL RHYTHMS</b>			
<b>Module coordinator</b>	<b>PATRICK VUILLEZ, UNIVERSITY OF STRASBOURG</b>			
<b>Course name</b>	<b>INTEGRATIVE PHYSIOLOGY, FOCUS ON BIOLOGICAL RHYTHMS</b>			
<b>Course teacher</b>	<b>PATRICK VUILLEZ, UNIVERSITY OF STRASBOURG</b>			<b>ECTS</b>
<b>Year</b>	2ND			6
<b>Semester</b>	S3, TRACK 2			
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>		
	128	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>
		28	4	
				<b>Personal work</b>
				96
<b>Course Description</b>	<p>Specific vocabulary, protocols and methods in the domain of rhythms. Properties of circadian rhythms. A master clock in the suprachiasmatic nuclei. Clock genes. Secondary oscillators and the multioscillatory system. Zeitgebers/synchronization. Melanopsin and photosensitive ganglionic cells of the retina. Feeding. Rhythms and metabolism. Outputs/distribution by nervous and endocrine cues. Photoperiodism and seasonal reproduction. Plasticity and seasonality, involvement of sexual steroids. Circadian time disorders. Chronobiology of psychiatric illnesses</p>			
<b>Aims and Outcomes</b>	<p>After course completion, student will</p> <ul style="list-style-type: none"> <li>- be sustainably aware that the temporal dimension and the daily rhythms are components of living organisms as important as their anatomy.</li> <li>- be able to design specific protocols and analyze data in order to take into account rhythmicity in his own research field (neuroscience, physiology, or any biological domain).</li> <li>- know the organization of a mammal as a multioscillatory circadian system, from the molecular aspects of endogenous rhythms to the nervous and endocrine physiological regulation of the organism in its environment.</li> <li>- know that pathologies are often linked to circadian time disorders, from mice to human and from metabolism to psychiatric illnesses.</li> <li>- realize the vital importance of seasonal rhythms in many species and know some mechanisms involved.</li> </ul>			
<b>Course Structure</b>	<p>The course will be entirely online. Lectures consist in different types of files weekly uploaded on Moodle. The level of difficulties is progressive (from “let’s start with a simple game”, to “what you have to know this week” and “try to go further by yourself on this subject”...). All along a document, personal thoughts are often solicited before to be asked to go further and to see the answer. A few entire lectures consist in “flipped class”. Personal work is always stimulated (“build your own glossary”...) and sometimes mandatory (different types of exercise and homework). Collaboration between students is encouraged (“upload your profile for the other students: I’m good and I can help you in the field of..., I’m weak and need your help in the field...”). Some lectures will be delivered as recorded video conferences from specialist colleagues. Two x 2h seminar are planned for discussion and questions/ answers (complementary to Moodle forum).</p>			
<b>Prerequisite</b>	<p>No prerequisite in chronobiology. Biology bachelor level in neuroanatomy, general physiology and/or cell biology are preferable to easily follow this course (at least 1 or 2 of these fields to avoid additional personal work).</p>			
<b>Course Requirements</b>	<p>Internet connection. Access to a video conference room (or personal material).</p>			
<b>Required text</b>	<p>In order to guide the students and to build the course with them, starting with no knowledge in chronobiology, the texts or other resources will be progressively given.</p>			
<b>Recommended Texts &amp; Other Readings</b>	<p>However, for the impatient students, one of these books for example:  Introducing Biological Rhythms: A Primer on the Temporal Organization of Life, with Implications for Health, Society, Reproduction, and the Natural Environment. Willard L. Koukkar, Robert B. Sothorn. Springer-Verlag NY Inc. 678 pages ISBN-10: 1402036914. ISBN-13: 978-1402036910</p>			

	<p>Rhythms of Life: The Biological Clocks That Control the Daily Lives of Every Living Thing. Russell G. Foster and Leon Kreitzman. Yale University Press. 276 pages. ISBN-10: 0300109695. ISBN-13: 978-0300109696</p> <p>Chronobiology: Biological Timekeeping. Jay C. Dunlap, Jennifer J. Loros and Patricia J. DeCoursey. Sinauer Associates Inc. 382 pages. ISBN-10: 0878933964. ISBN-13: 978-0878933969</p> <p>Circadian Physiology. Roberto Refinetti. CRC Press. 688 pages. ISBN-10: 0849322332. ISBN-13: 978-0849322334</p>
<b>Online Resources</b>	<p>and:  <a href="https://www.youtube.com/watch?v=qOXQgyRm0I">https://www.youtube.com/watch?v=qOXQgyRm0I</a>  <a href="https://www.youtube.com/watch?v=Pp6rfOr_LRg">https://www.youtube.com/watch?v=Pp6rfOr_LRg</a>  ...  Open Access Journal of Circadian Rhythms. <a href="http://www.jcircadianrhythms.com/">http://www.jcircadianrhythms.com/</a></p>
<b>Evaluation and Grading</b>	<p>Several personal works at home mentioned above give rise to a mark (including one by assessment of students by students) + a final 2h written examination.  The coefficient of the different marks is determined by the time required to corresponding homework.  The French system is used: rating from 0 to 20. (from 0: no worse, 10: just enough, 20: could not expect better work). But it can be adapted.</p>

<b>Module</b>	<b>INTEGRATIVE AND SYSTEM BIOLOGY</b>				
<b>Module coordinator</b>	<b>L. PEZARD</b>				
<b>Course name</b>	<b>COMPUTATIONAL NEUROSCIENCE AND NEURAL NETWORK</b>				
<b>Course teacher</b>	<b>R. KHALIL</b> <b>L. PEZARD</b>	<b>ECTS</b>			
<b>Year</b>	<b>SECOND</b>			<b>3</b>	
<b>Semester</b>	<b>S3</b>				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	70h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		15h		15h	40h
<b>Course Description</b>	This course introduces the main topics of the computational neurosciences and neuronal network models. Lectures give the theoretical foundations of the topic. They are completed by computer simulations of a specific neuronal network.				
<b>Aims and Outcomes</b>	After course completion student has the knowledge about the major themes of neuronal modelling. S/he is able to implement computer simulations using a dedicated software.				
<b>Course Structure</b>	<p>Details of how the course will be delivered: lectures/practical course/seminars/lab work/Realization of independently performed tasks by student etc.</p> <p>The lectures will comprise the main following topics:</p> <ul style="list-style-type: none"> <li>• Biophysics: from ionic channels to Hodgkin and Huxley model</li> <li>• Neuronal models and the geometry of excitability</li> <li>• Neuronal networks and simulators</li> <li>• Coding and information processing</li> </ul> <p>The practical course comprise 3 tutorials with the Brian neuronal simulator</p> <p>Practical tutorials and final computer project are independent task performed by the students with the help of teacher through forum and interactive plateforme.</p>				
<b>Prerequisite</b>	<p>Completed courses/Animal Experiment Licence etc.</p> <ul style="list-style-type: none"> <li>• Computer knowledge (software installation)</li> </ul>				
<b>Course Requirements</b>	<p>Internet connection/access to specified recourses or web sites etc.</p> <ul style="list-style-type: none"> <li>• Internet connection</li> <li>• Computer with Python language installed</li> </ul>				
<b>Required text</b>	Gerstner W. and Kistler, W. (2002) Spiking Neuron Models. Single Neurons, Populations, Plasticity. Cambridge University Press.				
<b>Recommended Texts &amp; Other Readings</b>	<p>There are several books that complement the content of the course:</p> <ul style="list-style-type: none"> <li>• Sterratt, D., Graham, B., Gillies, A. and Willshaw, D. (2011) Principles of Computational</li> </ul>				



	<p>Modelling in Neuroscience. Cambridge University Press.</p> <ul style="list-style-type: none"> <li>• Dayan P. and Abbott, L. F. (2001) Theroretical Neuroscience - Computational and Mathematical Modeling of Neural Systems. The MIT Press.</li> <li>• Ermentrout G.B. and Terman, D.H. (2010) Mathematical Foundations of Neurosciences. Springer</li> <li>• Koch C. (1999) Biophysics of Computation. Information Processing in Single Neurons. Oxford University Press</li> <li>• Izhikevich E. M. (2007) Dynamical Systems in Neuroscience. The Geometry of Excitability and Bursting. The MIT Press.</li> </ul>
<p><b>Online Resources</b></p>	<p>"Spiking Neuron Models" can be found on the web following the url:  <a href="http://icwww.epfl.ch/~gerstner/SPNM/SPNM.html">http://icwww.epfl.ch/~gerstner/SPNM/SPNM.html</a></p> <p>The Computational Neuroscience page of Scholarpedia:  <a href="http://www.scholarpedia.org/article/Category:Computational_neuroscience">http://www.scholarpedia.org/article/Category:Computational_neuroscience</a></p> <p>The Brian neuronal suimulator:  <a href="http://briansimulator.org/">http://briansimulator.org/</a></p>
<p><b>Evaluation and Grading</b></p>	<p>Method of calculating the final grade/method of learning outcomes verification</p> <p>Course examination 33%</p> <p>Computer project: 66% (tutorials 1/3 and final project 2/3)</p>

**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Module</b>	NEUROIMMUNOGENETICS AND INFLAMMATORY DISORDERS			
<b>Module coordinator</b>	MASMOUDI OLFA			
<b>Course name</b>	NERVOUS AND IMMUNE SYSTEM INTERACTIONS NEUROGENETICS AND NEUROEPIGENETICS OF BRAIN DISORDERS NEURON-GLIA INTERACTION: IMPLICATIONS IN NEUROINFLAMMATION			
<b>Course teacher</b>	GATI ASMA MEZGHANI MAHA GARBOUJE SOUHEILA MASMOUDI OLFA			<b>ECTS</b>
<b>Year</b>	2			6
<b>Semester</b>	2 (M2S3)			
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>		
	120 h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>
		60 h	10 h	20 h
<b>Course Description</b>	<p>Course: <b>Neurogenetics and Neuroepigenetics of brain disorders: From pathogenic mechanisms to pharmacogenomics</b></p> <ol style="list-style-type: none"> <li>1. Molecular bases of neurodegenerative disease with mendelian traits</li> <li>2. Genetics of common neurodegenerative diseases (Alzheimer, Parkinson, Schizophrenia, Autism...)</li> <li>3. Genetic testing for neurological disorders</li> <li>4. Genome-wide association studies (GWAS) in neurological disorders</li> <li>5. Whole-genome and whole- exome sequencing in neurologic diseases</li> <li>6. Single cell genomics of neurological and psychiatric diseases</li> <li>7. Implication of transposable elements in neurological disorders</li> <li>8. Unravelling of Central Nervous System Disease Mechanisms Using CRISPR Genome Manipulation</li> <li>9. Pathogenic RNA structures in neurological diseases</li> <li>10. Application of Microarrays to Neurological Disease: Neuro Array Consortium</li> <li>11. Role of non-coding RNAs in non-aging-related neurological disorders</li> <li>12. RNA Interference and Neurological Disorders and RNA metabolism in neurological disease</li> <li>13. Mechanisms of epigenetic regulation and Epigenetic regulation of chromatin in the Brain</li> <li>14. Aging as a risk factor for epigenetic alterations leading to neurodegeneration</li> <li>15. The role of genetic background as a predictor of drug response in neurodegenerative diseases</li> <li>16. Impact of genetic factors in randomized clinical trials (RCTs) on neurodegenerative diseases</li> </ol> <p>Course: <b>Nervous and Immune System Interactions</b></p> <ol style="list-style-type: none"> <li>1. Stem cells, lymphopoiesis and hematopoiesis</li> <li>2. Innate Immunity</li> <li>3. B cells repertoire and B cell differentiation</li> <li>4. T lymphocytes, antigen presentation and T cell differentiation</li> <li>5. Response regulation, tolerance, auto-Immunity</li> <li>6. Basic mechanisms regarding interactions between the nervous and immune system: Is the central nervous system an immunologically privileged organ?</li> <li>7. Importance of neuroglial cells in regards to maintaining a healthy brain</li> <li>8. The role of inflammatory mediators including cytokines and chemokines and their role in the neuroimmune response</li> <li>9. Immunoapathology of the nervous system : Inflammation and immune responses within SNC during infection, autoimmunity neurodegeneration and cancer development</li> <li>10. Immunotherapy for cancer in the central nervous system: Current and future directions</li> </ol> <p>Course: <b>Neuron-Glia interaction: Implications in neuroinflammation</b></p> <ol style="list-style-type: none"> <li>1. Interlink immune and nervous systems Under inflammatory and traumatic conditions</li> <li>2. Role of Glia in Neuroinflammation</li> <li>3. Role of Glia in Neuropathic Pain</li> </ol>			

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	<ol style="list-style-type: none"> <li>4. Tetrapartite synapse composed of pre-and post-synaptic neurons, astrocytes, and microglial</li> <li>5. Sensitized neuronal-glia circuits.</li> <li>6. Release of inflammatory mediators,</li> <li>7. Release of neurotrophins</li> <li>8. Epigenetic Regulation of Astrocyte Function in Neuroinflammation</li> </ol>
<b>Aims and Outcomes</b>	<p><i>Understand the Neurogenetics in neuropathology and Current technologies</i>  <i>Integrate new data of Current technologies to study the genetics of neurodegeneration</i>  <i>Understand the Implication of transposable elements in neurological disorders</i>  <i>Understand the role of RNA in development of neurological diseases</i>  <i>Understand Mechanisms of epigenetic regulation and implication in therapy</i>  <i>Understand neuroinflammatory and immune system pathways that impact neurodegeneration and novel exciting findings i.e. microvesicles, inflammasomes and signalosomes will ultimately enhance our understanding of the pathological process</i>  <i>Identify the epigenetic mechanisms regulating astrocyte responses in neurodegenerative diseases</i>  <i>Integrate epigenetic mechanisms that contribute to various functions of astrocytes from differentiation to inflammatory response.</i>  <i>Capacity to explore new avenues in the treatment of neurodegeneration.</i></p>
<b>Course Structure</b>	<p>Lectures  Videoconferences  Recorded courses  Interactive activities on the Moodle platform (quiz, wiki, chat, forum)  Group work for article analysis  Group work and flipped classroom</p>
<b>Prerequisite</b>	<i>Genetics, Immunology, Cellular neurobiology, Inflammation</i>
<b>Course Requirements</b>	<i>Access to the Master Moodle platform</i>
<b>Required text</b>	
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle
<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	<p><i>Article presentation OR course presentation, Practical activities (flipped classroom) (30%)</i>  <i>Final exam (70%)</i></p>

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<b>Module</b>	NEUROPROTECTION AND THERAPEUTIC APPROACHES			
<b>Module coordinator</b>	MASMOUDI OLFA			
<b>Course name</b>	BIOCHEMICAL AND MOLECULAR MITOCHONDRIAL DISORDERS MICROBIOME, MICROBIOTA, PROBIOTICS AND NEURODEGENERATIVE DISEASES NEUROPEPTIDES AND NEURONAL SURVIVAL			
<b>Course teacher</b>	MASMOUDI OLFA GHRAIRI TAOUFIK MARGHALLI SONIA KLIBI NAOUEL SADFI NAJLA	<b>ECTS</b>		
<b>Year</b>	2			<b>6</b>
<b>Semester</b>	2 (M2S3)			
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>		
	90 h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>
		62 h	8 h	20 h
<b>Course Description</b>	<p>Course: <b>Mitochondrial Dysfunction and Neurodegenerative Diseases</b></p> <ol style="list-style-type: none"> <li>Mitochondria metabolism and oxidative stress</li> <li>Oxidative Phosphorylation Disorders</li> <li>Ataxia and coenzyme Q10 deficiency</li> <li>Role of Mitochondria in Apoptosis and Autophagy: Targets in Neurodegenerative Disorders</li> <li>Mitochondrial Biogenesis as Therapeutic Target for Neurodevelopmental Disorders and Neurodegenerative Diseases</li> <li>Mitostasis in neurons: Maintaining mitochondria in an extended cellular architecture</li> <li>Axonal transport of mitochondria and mitochondrial fission and fusion: implication in neuron rejuvenation</li> </ol> <p>Course: <b>Microbiome, Microbiota, Probiotics and neurodegenerative diseases</b></p> <ol style="list-style-type: none"> <li>Gut microbiota and Enteric Nervous System</li> <li>Bidirectional dialogue between the gut and the brain involves : enteric and central neural network, neuroendocrine-hypothalamic-pituitary-adrenal axis, immune system, neurotransmitters and neural regulators directly produced by gut bacteria, and barrier paths</li> <li>Functional link between gut bacteria and neurodegenerative diseases (<math>\alpha</math>-Syn pathology, motor dysfunction, PD, AD, depression,...)</li> <li>Microglia Activation by the Microbiota</li> <li>Gut Inflammation and gut barrier dysfunction</li> <li>Gut Inflammation and Blood-Brain Barrier dysfunction</li> <li>Gut Microbiota in animal models of neurodegenerative diseases</li> <li>Potential Therapeutic Strategies: Dietary Supplements, Probiotics, Prebiotics, Antibiotics, Tool-Like receptor modulators, miRNA</li> </ol> <p>Course: <b>Neuropeptidergic Systems in neuroprotection</b></p> <ol style="list-style-type: none"> <li>Neuropeptides as regulators of neuronal survival in development: Role on cell proliferation and differentiation, axonal and dendritic growth and remodelling, synaptogenesis, synaptic function, and plasticity</li> <li>Neuroprotective properties of neuropeptides: Action against excitotoxic cell death, oxidative damage, inflammation and apoptosis</li> <li>Neuropeptidergic Systems in Autophagy: effects of PACAP, substance P, Agouti-Related Peptide and Proopiomelanocortin Peptides, neuropeptide Y (NPY), Urocortin</li> <li>Role of protective neuropeptides on neurogenesis modulation</li> <li>Role of neurotrophins (NGF, BDNF, ADNF) on aetiology and the therapeutic approaches for neurological disorders</li> </ol>			

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	<p>6. Interaction between neuroprotective neuropeptides and neurotrophins: regulation of neurotrophins expression, regulation of the expression of microRNAs, availability of neurotrophins.</p> <p>7. Clinical studies: Human NGF studies, Human GDNF studies</p>
<b>Aims and Outcomes</b>	<p><i>Understand the mechanism of mitostasis in neurons</i></p> <p><i>Understanding mitostatic apparatus transcends neurological disorders that are directly caused by disruption of that apparatus; in many pathological states</i></p> <p><i>Integrate new data that improve mitostasis to improve mitochondrial health and benefit neuronal survival</i></p> <p><i>Understand enteric microbiota-gut-brain axis</i></p> <p><i>Understand the role of gut microbiota in the development of neuropathologies</i></p> <p><i>Develop knowledge on the main principles and experimental models of gut microbiota dysfunction-induced neurological disorders</i></p> <p><i>Couple the results of up to date in new therapeutic strategies to restore the complex dialogue between enteric microbes and the host and re-establish a balanced gut-brain axis.</i></p> <p><i>Understand neuroinflammatory and immune system pathways that impact neurodegeneration and novel exciting findings i.e. microvesicles, inflammasomes and signalosomes will ultimately enhance our understanding of the pathological process</i></p> <p><i>Identify the epigenetic mechanisms regulating astrocyte responses in neurodegenerative diseases</i></p> <p><i>Integrate epigenetic mechanisms that contribute to various functions of astrocytes from differentiation to inflammatory response.</i></p> <p><i>Capacity to explore new avenues in the treatment of neurodegeneration.</i></p> <p><i>Knowledge the molecular mechanism of Neuropeptidergic Systems in neuroprotection</i></p>
<b>Course Structure</b>	<p>Lectures</p> <p>Videoconferences</p> <p>Recorded courses</p> <p>Interactive activities on the Moodle platform (quiz, wiki, chat, forum)</p> <p>Group work for article analysis</p> <p>Group work and flipped classroom</p>
<b>Prerequisite</b>	<p><i>Basis on cellular neurobiology</i></p> <p><i>Notions of physiology and molecular biology of the nervous system.</i></p> <p><i>Biochemistry and microbiology</i></p>
<b>Course Requirements</b>	<p><i>Access to the Master Moodle platform</i></p>
<b>Required text</b>	
<b>Recommended Texts &amp; Other Readings</b>	<p>Articles and reviews proposed in the dedicated course section on Moodle</p>
<b>Online Resources</b>	<p>Master Moodle platform</p>
<b>Evaluation and Grading</b>	<p><i>Article presentation OR course presentation, Practical activities (flipped classroom) (30%)</i></p> <p><i>Final exam (70%)</i></p>

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<b>Module</b>	CLINICAL NEUROSCIENCES				
<b>Module coordinator</b>	RIADH GOUIDER				
<b>Course name</b>	NEUROCOGNITIVE IMPAIRMENT NEURODEGENERATIVE DISEASES				
<b>Course teacher</b>	RIADH GOUIDER MOUNA BEN DJEBARA			<b>ECTS</b>	
<b>Year</b>	2			4	
<b>Semester</b>	3 (M2S3)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	80h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		10h	8h	30h	32h
<b>Course Description</b>	<p>Section 1 Neurocognitive decline: from semiology to etiology</p> <p>Section 2 Tauopathies including Alzheimer's disease, Fronto-temporal lobe degeneration</p> <p>Section 3 Synucleinopathies including Parkinson's disease, Lewy Body Dementia, Multiple System Atrophy</p>				
<b>Aims and Outcomes</b>	<p>Acquire our current understanding of important human neurodegenerative disorders' clinical pictures and pathological mechanisms</p> <p>Gain an knowledge of specific research approaches and methods to address various aspects of neurodegenerative diseases</p> <p>Integrate new data in diagnostic and treatment strategies in the field of neurodegenerative disorders</p> <p>Form an overview of current limits and future needs in these fields</p>				
<b>Course Structure</b>	<p>Lectures</p> <p>Videoconferences</p> <p>Group work for article analysis</p> <p>Group work and flipped classroom</p>				
<b>Prerequisite</b>	Basis on neuroanatomy and neurophysiology				
<b>Course Requirements</b>	Access to the Master Moodle platform				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle				
<b>Online Resources</b>	Master Moodle platform				

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<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)				
<b>Module</b>	CLINICAL NEUROSCIENCES				
<b>Module coordinator</b>	RIADH GOUIDER				
<b>Course name</b>	NEUROCOGNITIVE IMPAIRMENT NEURODEGENERATIVE DISEASES				
<b>Course teacher</b>	RIADH GOUIDER MOUNA BEN DJEBARA			<b>ECTS</b>	
<b>Year</b>	2			4	
<b>Semester</b>	3 (M2S3)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	80h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		10h	8h	30h	32h
<b>Course Description</b>	<b>Section 1</b> Neurocognitive decline: from semiology to etiology <b>Section 2</b> Tauopathies including Alzheimer's disease, Fronto-temporal lobe degeneration <b>Section 3</b> Synucleinopathies including Parkinson's disease, Lewy Body Dementia, Multiple System Atrophy				
<b>Aims and Outcomes</b>	Acquire our current understanding of important human neurodegenerative disorders' clinical pictures and pathological mechanisms Gain an knowledge of specific research approaches and methods to address various aspects of neurodegenerative diseases Integrate new data in diagnostic and treatment strategies in the field of neurodegenerative disorders Form an overview of current limits and future needs in these fields				
<b>Course Structure</b>	Lectures Videoconferences Group work for article analysis Group work and flipped classroom				
<b>Prerequisite</b>	Basis on neuroanatomy and neurophysiology				
<b>Course Requirements</b>	Access to the Master Moodle platform				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle				



**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)



**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Module</b>	CLINICAL NEUROSCIENCES				
<b>Module coordinator</b>	RIADH GOUIDER				
<b>Course name</b>	NEURODEVELOPMENTAL DISORDERS				
<b>Course teacher</b>	RIADH GOUIDER ICHRAF KRAOUA			<b>ECTS</b>	
<b>Year</b>	2			2	
<b>Semester</b>	2 (M2S3)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	60h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		8h	6h	16h	30h
<b>Course Description</b>	<p><b>Section 1</b> Intellectual and developmental disability and motor disorders including developmental coordination disorders and stereotypic movement disorders</p> <p><b>Section 2</b> Disorders due to neurotoxicants including fetal alcohol spectrum disorder, Minamata disease, behavioural disorders including conduct disorders</p> <p><b>Section 3</b> Genetic disorders including fragile-X syndrome, Down syndrome, attention deficit hyperactivity disorder</p>				
<b>Aims and Outcomes</b>	<p>Acquire our current understanding of neurodevelopmental disorders' clinical pictures and pathological mechanisms</p> <p>Understand basis and consequences of intra-utero brain aggression</p> <p>Integrate new data in diagnostic and treatment strategies in the field of neurodevelopmental disorders</p> <p>Form an overview of current limits and future needs in these fields</p>				
<b>Course Structure</b>	<p>Lectures</p> <p>Videoconferences</p> <p>Group work for article analysis</p> <p>Group work and flipped classroom</p>				
<b>Prerequisite</b>	Basis on neuroanatomy and neurophysiology				
<b>Course Requirements</b>	Access to the Master Moodle platform				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle				



**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)

**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Module</b>	<b>CLINICAL NEUROPHYSIOLOGY</b>				
<b>Module coordinator</b>	<b>RIADH GOUIDER</b>				
<b>Course name</b>	<b>CLINICAL NEUROPHYSIOLOGY IN NEUROMUSCULAR DISEASES CLINICAL NEUROPHYSIOLOGY IN CENTRAL NERVOUS SYSTEM DISORDERS</b>				
<b>Course teacher</b>	<b>RIADH GOUIDER AMINA GARGOURI IMEN KACEM</b>			<b>ECTS</b>	
<b>Year</b>	2			<b>3</b>	
<b>Semester</b>	2 (M2S3)				
<b>Workload</b>	<b>Total nb of hours</b>	<b>Nb of hours</b>			
	86h	<b>Lecture</b>	<b>Seminar</b>	<b>Practical Course/Lab work</b>	<b>Personal work</b>
		12h	9h	20h	45h
<b>Course Description</b>	<p>Section 1 Basis on neurophysiological explorations including physiology, signal genesis and transmission in excitable structures, signal treatment Introduction to neurophysiological tests such as electroneuromyography, evoqued potentials, electroencephalography and polysomnography</p> <p>Section 2 Electroneuromyographic semiology in peripheral neuropathies, motor neuron diseases, myopathies and neuromuscular junction disorders</p> <p>Section 3 Electroencephalographic semiology in epileptic and non epileptic disorders</p>				
<b>Aims and Outcomes</b>	<p>Acquire our current understanding on essentials of electrodiagnostic in neurology Understand electrical signal from the brain, spinal cord and periphial nerves and how their analysis is expected to make earlier diagnosis of several conditions Integrate new data in electrodiagnostic tools in the field of central and peripheral nervous system disorders</p>				
<b>Course Structure</b>	<p>Lectures Videoconferences Group work for article analysis Group work and flipped classroom</p>				
<b>Prerequisite</b>	Basis on neuroanatomy and neurophysiology				
<b>Course Requirements</b>	Access to the Master Moodle platform				
<b>Required text</b>					
<b>Recommended Texts &amp; Other Readings</b>	Articles and reviews proposed in the dedicated course section on Moodle				



**Track 3: Neuropathology, Neuroprotection and Clinical Neurosciences**

<b>Online Resources</b>	Master Moodle platform
<b>Evaluation and Grading</b>	Article presentation OR course presentation (flipped classroom) (40%) Final exam (60%)

## EMN-Online Grading Scale

The ECTS grading scale is based on the class percentile of a student in a given assessment as shown in the following table.

It indicates how he/she performed relative to other students in the same class.

The marks are then converted into the local systems.

Grade	best/next	Definition
A	10 %	outstanding performance with only minor errors
B	25 %	above the average standard but with some errors
C	30 %	generally sound work with a number of notable errors
D	25 %	fair but with significant shortcomings
E	10 %	performance meets the minimum criteria
F		Fail