COURSE OUTLINE

(1) GENERAL

SCHOOL	
ACADEMIC UNIT	**Interdisciplinary Graduate Programme in the BRAIN and MIND sciences**
LEVEL OF STUDIES	7
COURSE CODE	**B&M-102A** SEMESTER **Fall**
COURSE TITLE	Introduction to Systems Neuroscience II: Movement and Cognitive Functions

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
lectures	6	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General Background
PREREQUISITE COURSES:	N/A
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

In the first module of Systems Neuroscience, students gain knowledge about how sensory information is perceived and how perception shapes internal representations of the body and the environment. In this module, students further expand their understanding of how motor centers in the brain and spinal cord generate neural commands that execute coordinated, purposeful movements.

Upon successful completion of the course, students will acquire specialized knowledge regarding:
- How internal representations of the body and the external world guide movement.
- How these representations are updated based on changing internal and external sensory information to maintain accuracy throughout movement execution.
- How the interaction between motor and sensory systems influences decision-making for executing one movement over another.
- How the goal of a movement is determined, and its execution plan is formulated.
- How the parietal and premotor areas interact to define the spatial parameters of movement.

- How sensory information about the target's position in the environment is integrated with sensory input regarding the position of the effector in space.
- How the spatiotemporal details of muscle contractions required for executing a planned movement are coordinated.

Additionally, students will develop an understanding of:
- The laws governing movement, including the constants and regularities that describe it.
- The functional hierarchy of motor systems and the level of movement organization in which each system participates.
- The anatomical and functional basis of motor disorders resulting from dysfunction or damage at specific points along motor pathways.

Upon successful completion of the course, students will be able to:
- Demonstrate a comprehensive understanding of the course material.
- Understand the fundamental theories, concepts, and principles governing movement and higher cognitive functions.
- Reproduce acquired knowledge and effectively communicate it in a clear and unambiguous manner to both specialized and non-specialized audiences.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*......*
Production of new research ideas	*Others...*
	....

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Working in an interdisciplinary environment
- Production of new research ideas
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Muscle receptors, spinal circuits and reflexes
- Psychophysics of voluntary movements
- Movement Control: The primary motor cortex
- Movement Control: The premotor and parietal cortex
- Basal Ganglia
- Cerebellum
- The oculomotor system I
- The oculomotor system II
- Mental simulation of action
- Language and executive functions / Association cortices and lateralization of function in the brain

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Integration of ICT in teaching Utilizing the elearn platform for uploading teaching materials Communication via "e-learn" and e-mail

TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	Activity	Semester workload
	Lectures	30
	non-directed study	120
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Evaluation Language: English Assessment Methods: Multiple-choice questionnaires, short-answer questions Written exam (oral examination available in special cases) Evaluation criteria are outlined in the study guide and communicated to students at the beginning of the course.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Νευροεπιστήμη και Συμπεριφορά, μετάφραση του Essentials of Neural Science And Behavior Edited by Kandel ER, Schwartz JH, Jessell TM από τους Καζλαρής ΕΧ, Καραμανλίδης Α, Παπαδόπουλος ΧΓ, Πανεπιστημιακές Εκδόσεις Κρήτης
- Principles of Neural Science, 4th Edition, Edited by Kandel ER, Schwartz JH, Jessell TM, McGraw Hill, 2000.
- Principles of Neural Science, 5th Edition, Edited by Kandel ER, Schwartz JH, Jessell TM, Siegelbaum SA, Hudspeth AJ, McGraw Hill, 2012.
- Principles of Neural Science, 6th Edition, Edited by Kandel ER, Koester JD, Mack SH., Siegelbaum SA, McGraw Hill, 2021.
- Neuroscience, 6th Edition, Purves D, Augustine G, Fitzpatrick D, Hall W, LaMantia A, White L, Mooney R, and Platt M, Oxford University Press, 2018.
- Fundamental Neurosciece, 4th Edition, Edited by Squire L, Berg D, Bloom FE, du Lac S, Ghosh A, Spitz NC, Academic Press, 2012.