UAB
Universitat Autònoma de Barcelona

Cognitive Processes

Code: 106577
ECTS Credits: 6

2025/2026

Degree	Type	Year
Artificial Intelligence	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

No prerequisites are required.

Objectives and Contextualisation

The goal of this course is to provide a multidisciplinary approach to AI research by integrating the latest advances in cognitive neuroscience. Today, the human brain is the most advanced and efficient information processor known, making it a crucial biological model for current and future AI systems. Students will explore cutting-edge theories on how the brain processes information and performs various cognitive functions, such as learning, memory, perception, language, decision-making, and emotion. The course will also examine how these functions are currently implemented in AI models, alongside a detailed description of the corresponding human cognitive processes.

Competences

- Communicate effectively, both orally and in writing, adequately using the necessary communicative resources and adapting to the characteristics of the situation and the audience.
- Conceive, design, analyse and implement autonomous cyber-physical agents and systems capable of interacting with other agents and/or people in open environments, taking into account collective demands and needs.

- Identify, understand and analyse the fundamental characteristics of neural mechanisms and human psychological and cognitive processes and relate them to the processes of automatic intelligent systems.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Work independently, with responsibility and initiative, planning and managing time and available resources, and adapting to unforeseen situations.

Learning Outcomes

1. Apply concepts and identify psychosocial processes in the analysis of people's behaviour in technological contexts.
2. Apply knowledge of social interaction to the design of artificial intelligence devices.
3. Communicate effectively, both orally and in writing, adequately using the necessary communicative resources and adapting to the characteristics of the situation and the audience.
4. Identify and distinguish the main cognitive functions involved in human behaviour.
5. Identify cognitive biases and heuristics and their influence on decision-making.
6. Identify psychosocial concepts and processes that help to understand and explain social interaction between people.
7. Identify the cognitive bases of human verbal and non-verbal language and their relationship to thought.
8. Identify the main characteristics, types and functions of emotions and how they relate to cognitive functions.
9. Integrate and relate human cognitive and emotional functions to behaviour predictions.
10. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
11. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
12. Understand the different sensory modes of information capture and processing, as well as their biological foundations.
13. Work independently, with responsibility and initiative, planning and managing time and available resources, and adapting to unforeseen situations.

Content

1. An introduction to cognitive psychology (3 sessions)

    1. Historical evolution of cognitive neuroscience
    2. The brain as an information processing system
    3. Introduction to the methodology in cognitive neuroscience

2. Attention (1 session)

    1. What is attention?
    2. Models of attention

3. Perception (2 sessions)

    1. What is to perceive?
    2. Perceptual organization
    3. Sensory modalities

4. Learning (1 session)

1. What is learning?
2. Types of learning
3. Mechanisms of learning

5. Memory (2 sessions)

1. What is memory? (2 sessions)
2. Memory systems
3. Neurobiology of Memory
4. Memory models
5. Memory and Spatial Navigation

6. Decision-making (1 session)

1. The brain as a decision-making agent.
2. Perceptual and value-based decisions.
3. Neural mechanisms of decision
4. Neuroeconomics and heuristics

7. Emotion & Motivation (1 session)

1. What are emotions?
2. Theories of emotion
3. Emotion and mood
4. Mood disorders

8. Language & Consciousness (1 session)

1. Theories of Consciousness
2. The language system in the brain
3. Large Language Models

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master classes	24	0.96	1, 12, 6, 5, 8, 4, 7, 9
Seminars	24	0.96	1, 3, 6, 10
Type: Supervised			
Tutoring (group and individual)	20	0.8	10, 13
Type: Autonomous			
Individual Study	50	2	1, 2, 12, 6, 5, 8, 4, 7, 9
Team work	20	0.8	3, 10, 13

Teaching Methodology

The teaching methodology is based on various formative activities. Over the 12.5 weeks of the course, lectures, seminars, workshops, supervised activities, and independent activities will be scheduled.

Type: Directed (50 hours)

- Lectures
- Seminars (PAUL)
- Assessment

Type: Supervised (20 hours)

- Tutorials (group and individual)

Type: Independent (55 hours)

- Study
- Teamwork
- Preparation of oral presentations

Within the schedule established by the center or the curriculum, 15 minutes of one class will be reserved for students to evaluate the teaching staff and the subjects or modules through questionnaires.

Use of Artificial Intelligence

For this subject, the use of Artificial Intelligence (AI) technologies is permitted exclusively for support tasks, such as bibliographic or information searches, text correction, or translations.
The student must clearly identify which parts were generated using this technology, specify the tools used, and include a critical reflection on how these tools influenced the process and the final result of the activity.
Lack of transparency in the use of AI in an assessable activity will be considered academic dishonesty and may result in partial or total penalties in the activity's grade, or more severe sanctions in serious cases.

Gender Perspective

All teaching materials provided by the teaching staff, as well as students' written work and oral presentations, must avoid the use of sexist language.
Inclusive and non-discriminatory language must be used consistently to promote gender equality and respect for all identities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First Partial Exam	25%	2	0.08	1, 12, 4, 7, 9, 11, 10, 13
Laboratory practices (PLAB)	30%	4	0.16	1, 2, 3, 9, 11, 13
Second Partial Exam	25%	2	0.08	1, 2, 6, 5, 8, 7, 9, 11
Seminars (PAUL)	20%	4	0.16	3, 6, 5, 8, 4, 7, 10, 13

Assessment

The evaluation of this subject is conducted continuously and has a clear formative purpose. The competencies associated with this subject will be assessed through follow-up activities, group presentations and reports, as well as exams. The learning evidence that students must submit will reflect the content and competencies addressed in theoretical classes, seminars, and laboratory practicals.

The evaluation system is structured around five types of evidence, each contributing a specific weight to the final grade:

- Evidence 1 (Master Class Evaluation): Exams
    - A) Midterm exam (25%)
    - B) Final exam covering the second half of the semester (25%)
- Evidence 2 (Seminar Evaluation):
    - Group presentation of a manuscript (20%)
- Evidence 3 (Laboratory Session Evaluation):
    - A) Presentation sessions (15%)
    - B) Written report (15%)

Passing Criteria

To pass the subject, students must meet the following conditions:

1. Achieve an average score of at least 3.5 in the exams under Evidence 1.
2. Obtain an overall average score of 5.0 or higher across all five evidences.
3. Submit at least 4 out of the 5 required evidences.

Failure to meet the third criterion (i.e., submitting fewer than 4 evidences) will result in the subject being marked as Not Assessable.

Attendance

Attendance is mandatory for all PLAB and PAUL sessions. Any absences must be justified with an official document.

Retest

To be eligible for a retest, students must:

1. Have submitted at least 4 of the 5 evidences.
2. Have an average score between 3.5 and 4.9 in the exams under Evidence 1.

The retest will consist of a comprehensive exam covering all theoretical content. To pass the subject, students must score 5 or more points on the retest. Additionally, the average score across all remaining evidences must still be greater than 5. The maximum grade achievable through the retest is Approved (5.0).

This subject does not offer a synthesis test for second or subsequent enrollments.

Single Assessment

This subject does not offer the option of a single assessment (i.e., a single final evaluation).

Academic Integrity

In cases of copying, plagiarism, or similar misconduct, the grade for the affected activity will be zero (0), without prejudice to any additional disciplinary actions deemed appropriate.

Bibliography

Eysenck, M.W. & Keane, M.T. (2020). *Cognitive Psychology. A Student's Handbook*. Routledge.

Eysenk, M.W. & Groome, D. (2015). *Cognitive Psychology: Revisiting the classic studies*.

Gazzaniga, M. S., & Mangun, G. R. (Eds.). *The cognitive neurosciences* (5th ed.). Boston Review.

Churchland, P. S., & Sejnowski, T. J. (1992). *The computational brain.* The MIT Press.

Goldstein, E. B. *Sensation and perception* (8th ed.). Wadsworth.

Software

Bringing a personal laptop may be required for some lectures. Specific dates will be communicated by the lecturer.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	English	first semester	morning-mixed
(TE) Theory	71	English	first semester	afternoon