UNIVERSITÀ DI TRENTO

Questa tabella sostituisce la tabella allegata al Regolamento didattico del corso di Laurea Magistrale in Cognitive Science emanato con DR n.600 del 30.06.2018

Tabella 1 – Obiettivi delle attività formative previste dal percorso

Table 1 – Objectives of educational activities

"Corso di laurea magistrale in Scienze Cognitive – Cognitive Science": obiettivi delle attività formative previste per la coorte a.a. 2020/2021 e successive

Master's program in Cognitive Science: Planned Educational objectives subsequent 2020/2021

CURRICULUM CN – COGNITIVE NEUROSCIENCE

Nome insegnamento Course name	Obiettivi formativi Educational objectives
Foundations of Cognitive Psychology and Neuroscience I	This course will examine to perceive, pay attention, remember, plan and represent ours and others' actions. It will explore the neuroanatomical and neurophysiological basis of cognitive functions, considering evidence form functional neuroimaging and clinical studies. The teaching methods will include lectures, demonstrations, patient videos, class discussion. By the end of this course, students will have gained a much better understanding of the basic topics in cognitive psychology and neuroscience and will be able to describe the appropriate methods.
Foundations of Cognitive Psychology and Neuroscience II	This course will examine the mental processes underlying "higher level" cognitive functions. Specifically, it will explore our ability to perform culturally mediated functions (such as reading, writing, and mathematics), as well as our capacity to reason, make decisions, and solve problems. It will also examine issues related to neurocognitive development. The course will explore the behavioral, neuroanatomical, and neurophysiological basis of aforementioned cognitive functions, considering evidence from cognitive psychology, functional neuroimaging and clinical studies. The teaching methods will include lectures, videos, and class discussions. By the end of this course, students will have gained a much better understanding of the basic topics in cognitive psychology and neuroscience and will be able to describe the appropriate methods.
Advanced Cognitive Psychology and Neuroscience	This course will sample from across the cognitive psychology and neuroscience, offering an in-depth look into a selection of contemporary and influential topics. This course will involve the reading, active discussion and presentation of original research papers and review articles. At the end of the course the students will be able to: understand the main notions and the key problems related to the specific topic addressed in the module and to analyse critically the scientific literature.
Research Design	This course will cover some fundamentals of algebra, probability theory, and statistics. Furthermore, the course will cover all aspects of a research project, such as, sample sizes, measures, and type of experimental designs. Students will present and comment research on cognitive science topics. Discussions also include presentations of research to various audiences, abstracts, reviews, grant process, and scientific ethics.
Psycholinguistics	This course will promote an in-depth understanding of the cognitive and neurobiological bases of human language, as informed by multidisciplinary research in psycholinguistics that combines behavioral, psychophysiological, and brain imaging approaches. Particular emphasis will be given to experimental methods and evidence, and to derived psycholinguistic and neurocognitive models on language abilities, both in normal and in pathological conditions. At the end of the course, students should have acquired a good overview of state-of-the-art psycholinguistic theories and research directions, and should have learned the relevant concepts and appropriate terminology with respect to language comprehension and production, reading, language development and acquisition, as well as multilingualism.
Introduction to Computer Programming	The course introduces computer programming, focusing on those aspects that are most relevant to behavioral and neuroimaging studies in cognitive neuroscience. At the end of the course, the students should be able to master the computer language proposed.
Neural Foundations of Human Behavior	This course has been designed to cover basic anatomical and functional aspects of the central nervous system. Specific topics covered include neuronal function, synaptic transmission, sensory processing, movement, sleep and neural plasticity. At the end of the course, the students should be able to summarize our understanding of the functional organization of the human brain.
Foundations of Brain Imaging	This course will cover the foundations of neuroimaging techniques commonly used in cognitive neuroscience. Students will obtain a basic understanding (i.e., methodological foundation) of non-invasive brain imaging and neurostimulation techniques used in cognitive neuroscience research. The programme

	contains specialized modules on the theory and methods of functional and structural magnetic resonance imaging; electro- and magneto-encephalography; transcranial electric and magnetic stimulation, as well as multimodal approaches. At the end of the course, students should be able to describe the basic principles, advantages, limitations and cognitive neuroscience application examples of the neuroimaging methods discussed.
Brain Development and Desease	This course will address molecular, cellular, anatomical and functional aspects of central nervous system development and major neuropsychiatric/neurological disorders. Specific topics will include embryonic development, postnatal critical periods for acquisition of sensory, motor and cognitive functions, neurodevelopmental disorders, and major neurodegenerative diseases. At the end of the course, the students should be able to acquire an updated view of our understanding of human brain development and its impact on brain pathologies.
Current Issues in Neuroscience: Animal Models	The course would provide the theoretical and empirical foundations of comparative research on animal cognition. It will cover all the traditional topics in animal cognition - perception, learning and memory, categorization, thinking and reasoning, and communication/language. Practical in the animal cognition lab will be part of the course.
Cellular and Molecular Neuroscience	The main purpose of the course is to provide students with a general understanding of the fundamental molecular properties of neurons and neuronal networks. This course will also examine the cellular and molecular basis of neuronal dysfunctions, using the fundamental understanding of molecular networks as a framework to explore the mechanisms that underlie neurological disorders. In the second part, the course involves practical laboratory activities, exploring molecular techniques currently used in neuroscience.
Clinical Neurology and Neuropsychology	The aim of this course is to provide basic concepts and knowledge on the clinical neurosciences, with emphasis on behavioral and psychological aspects. The student will be introduced to the main categories of disorders of the nervous system, focusing mainly on the etiology, physio-pathological mechanisms, and impact on behavior. In a second section we will address the topics of clinical and cognitive neuropsychology. The course will cover the history of neuropsychology, the main neuropsychological syndromes, and the essential methodological tools for neuropsychological diagnosis. This course should provide the students with the basic knowledge to understand brain disorders and their role as model to test hypotheses in the cognitive neurosciences.
Fundamental Hands on Functional Neuroimaging Analysis	The first part of the class focuses on fMRI data analysis, i.e. the statistics of fMRI data analysis and how that should influence your design decisions and conclusions. By understanding the statistical concepts of fMRI data analysis, students will understand the rationale of the preprocessing pipeline in fMRI and the types of choices fMRI researchers have to make when designing their experiments. By actually modeling and analyzing fMRI data students will get a deeper understanding of fMRI data analysis and at the same time gain experience that will make it easier for them to read fMRI papers and to perform their own imaging studies in the future. The second part of the course involves the hand on analysis of MEG data.
Current Topics in Brain Connectivity	In this seminar course, we will read and discuss up-to-date scientific contributions in the field of general brain connectivity, focusing on both functional and anatomical connectivity measures. The goal of this introductory course is to provide a basic knowledge of the state-of-the-art methods and concepts of accessing brain connectivity measures. The course is based on active learning and participation. At the end of the course, students will acquire a good overview of the current debates on brain connectivity and they will learn the appropriate terminology and computational concepts. They will familiarize with the concepts of experimental connectivity measures and they will be able to critically access new publications on the topic.
Advanced Topics in Memory	The goal of this advanced course is to provide students with an in-depth overview of current advances in memory research. The course purports to promote active learning and participation in classroom activities. At the end of the course, the students should be able to critically analyze the scientific literature on memory, and discuss the content of scientific articles in the classroom. The main topics covered by the course include the neurofunctional bases of working, short-term, episodic, and semantic memory, as well as the molecular mechanisms of memory consolidation, reinstatement, decline, and enhancement.
Internship	The internship is a period of training done by the student within the degree program, in order to achieve moments of alternation between study and work and to facilitate future career developments.
Master Thesis	The final examination is an important moment in the pathway of study for two primary reasons. First, it allows for verification of the student's capacity to integrate content from the program and apply this knowledge to his/her own empirical research. Second, it allows for assessment of the student's skills in formulating, writing and discussing a scientific argument.

CURRICULUM LMI - LANGUAGE AND MULTIMODAL INTERACTION

Nome insegnamento Course name	Obiettivi formativi Educational objectives
Understanding Cognitive Psychology and Neuroscience	The aims of the course are to provide students with a broad understanding of the mental processes underlying cognitive functions. It will explore the neuroanatomical and neurophysiological basis of cognitive functions, considering evidence form functional neuroimaging and clinical studies. In doing so, students will also learn about the goals of cognitive psychology and cognitive neuroscience research and the methods that are being employed to reach these goals.
Computational Linguistics	The course introduces the basics of computational linguistics by giving an overview of the field. It then focuses on the syntax and semantics of natural language familiarizing students with lexicalized formal grammars and computational semantics models. The second part of the course introduces students to multimodal models by considering in particular language and vision modalities. Students will hence gain a good overview of the field, its methods and main long-term goals.
Computational Skills for Text Analysis	The course introduces computer programming, focusing on those aspects that are most relevant to text processing: regular expressions, text segmentation, and extraction of lexical and linguistic information from text.
Current Topics in Language and Brain	In the first part of the course, we will address how different data sources have been used in the past to draw inferences on the relationships between language and the brain, and if/how the same sources can be used to complement current neuroimaging techniques. In the second part of the course, we will focus on three topics: the functional neuroanatomy of reading/writing, and how the brain adapted to the development of written language; the neural underpinnings of (morpho) syntactic skills; the neural correlates of phonological working memory.
Functional Anatomy of Language	This course provides information about the organization of the brain and its networks, focusing on the neural correlates of language and how, during the years, this knowledge has evolved. It provides also some basic information on the effects of brain lesions.
Human Language Technologies	The course introduces how to computationally approach and manage human language technologies. The topics covered are creation of annotated corpora, syntax (e.g. parsing), semantics (e.g. similarity, word sense disambiguation), until more advanced issues of pragmatics such as affective and emotion recognition, computational treatment of persuasive and creative language. Particular attention will be given to the use of out-of-the-shelf NLP tools, so that the students can gain hands on experience.
Internship	The internship is a period of training done by the student within the degree program, in order to achieve moments of alternation between study and work and to facilitate future career developments.
Intro to Human Language	This module is an introduction to language science (linguistics) covering phonetics and phonology, morphology and lexical knowledge, syntax, phrase semantics, discourse, and anaphora. No previous knowledge of linguistics is required.
Introduction to Machine Learning for Natural Language Processing	This class presents a survey of methods from the fields of statistics and machine learning aimed at extracting generalizations from example data, and use them to automatically analyze new data. The class focuses on case studies in the analysis of different components of natural language.
Logical Structures in Natural Language	A general introduction to the study of meaning in natural language using the tools of formal semantics. Topics include the relation of predicate logic with natural language operators; lexical semantics, compositional semantics, nominal and verbal quantifications; modification; event semantics; genericity, and the semantics of grammatical features.
Master Thesis	The final examination is an important moment in the pathway of study for two primary reasons. First, it allows for verification of the student's capacity to integrate content from the program and apply this knowledge to his/her own empirical research. Second, it allows for assessment of the student's skills in formulating, writing and discussing a scientific argument.
Research Design	This course will cover some fundamentals of algebra, probability theory, and statistics. Furthermore, the course will cover all aspects of a research project, such as sample sizes, measures, and type of experimental designs. Students will present and comment on their own research projects in progress. At the end of the course, the students should be able to design an experiment.
Language e Social Cognition	Language comprehension necessitates construction of sentential meanings but is also linked to evaluative, inferential, and social-cognitive processes that are triggered by sentence content. The course will address these processes, and discuss issues including but not limited to: the relation between comprehension belief and verification; language and persuasion; how language promotes confirmatory or counterfactual cognitions; the impact of narrator reliability; processes specific to discourse-level processing and story-

	telling

Table 2: curriculum of the Cognitive Neuroscience (CN) track

Master's programme in Cognitive Science: planned educational objectives subsequent to 2020/2021

First year

Compulsory courses

Course Name	CFU	SSD	Type of Activity	Prerequisites
Foundations of Brain Imaging	9	M-PSI/02	caratterizzante	---
Foundations of Cognitive Psychology and Neuroscience I	6	M-PSI/01	caratterizzante	---
Foundations of Cognitive Psychology and Neuroscience II	6	M-PSI/02	caratterizzante	---
Advanced Cognitive Psychology and Neuroscience	6	M-PSI/01 M-PSI/02	caratterizzante	---
Introduction to Computer Programming	6	ING-INF/05	caratterizzante	---
Neural Foundations of Human Behaviour	6	BIO/09	caratterizzante	---
Research Design	6	M-PSI/02	caratterizzante	---
Psycholinguistics	6	L-LIN/01	caratterizzante	---

Constrained choice courses - 2 from:

Course Name	CFU	SSD	Type of Activity	Prerequisites
Clinical Neurology and Neuropsychology	6	M-PSI/08	Affine	---
Current Issues in Neuroscience: Animal Models	6	M-PSI/02	Affine	---
Current Topics in Brain Connectivity	6	M-PSI/02	Affine	---
Brain Development and Disease	9	M-PSI/02	6 cfu Affine 3 cfu a scelta libera	---
Fundamental Hands on Functional Neuroimaging Analysis	6	M-PSI/02	Affine	---
Cellular and Molecular Neuroscience	9	M-PSI/02	6 cfu Affine 3 cfu a scelta libera	---
Advanced topics in memory	6	M-PSI/02	Affine	---

Second year

Compulsory courses

Course Name	CFU	SSD	Type of Activity	Prerequisites
Internship	15		other activities	Having already acquired at least 45 ECTS
Master Thesis	30		other activities	---

Free choice courses

The curriculum provides for the acquisition of 12 ECTS credits without scientific disciplinary sector constraints, chosen from the teaching activities that are specifically activated by degree course and published annually in the manifesto of studies or among those activated by the University.

Table 3: curriculum of the Language and Multimodal Interaction (LMI) track

Master's programme in Cognitive Science: planned educational objectives subsequent to 2020/2021

First year

Compulsory courses

Course Name	CFU	SSD	Type of Activity	Prerequisites
Computational Linguistics	9	ING-INF/05	caratterizzante	---
Current Topics in Language and Brain	6	MPSI/02	caratterizzante	
Understanding Cognitive Psychology and Neuroscience	9	M-PSI/01	caratterizzante	---
Functional Anatomy of Language	6	M-PSI/02	caratterizzante	---
Intro to Human Language	6	L-LIN/01	caratterizzante	---
Introduction to Machine Learning for Natural Language Processing	9	ING-INF/05	caratterizzante	---
Research Design	6	M-PSI/02	caratterizzante	---

Constrained choice courses- 2 from:

Course Name	CFU	SSD	Type of Activity	Prerequisites
Computational Skills for Text Analysis	6	ING-INF/05	Affine	---
Neuroimaging for Data Science	6	M-PSI/02	Affine	Mutuato dal Dipartimento di Matematica
Human Language Technologies	6	ING-INF/05	Affine	---
Logical Structures in Natural Language	6	M-FIL/05	Affine	---
Language and Social Cognition	6	M-PSI/02	Affine	---

Second year

Compulsory courses

Course Name	CFU	SSD	Type of Activity	Prerequisites
Internship	15		other activities	Having already acquired at least 45 ECTS
Master Thesis	30		other activities	---

Free choice courses

The curriculum provides for the acquisition of 12 ECTS credits without scientific disciplinary sector constraints, chosen from the teachings that are specifically activated by degree course and published annually in the manifesto of studies or among those activated by the University.