



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Research Methods in Cognitive Neuroscience

2122-1-F5105P020

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#### Learning area

RESEARCH METHODS IN EXPERIMENTAL PSYCHOLOGICAL SCIENCES

#### Learning objectives

##### *Knowledge and understanding*

- Knowing the functional and technical properties of the most important non-invasive research methods in Cognitive neuroscience
- Understanding the genesis and dynamics of brain signals and how they do reflect mental functions

##### *Applying knowledge and understanding*

- Acquisition of the technical ability to apply the acquired knowledge in order to design and carry out real empirical studies in the field of Applied Psychology and related disciplines (see a list below).

#### Contents

This laboratory course provides essential knowledge of main research techniques based on electromagnetic signals of the brain (EEG/ERP/MEG) in order to promote the theoretical and practical application of their use in several domains of applied Psychology.

The first module will provide a theoretical knowledge about the techniques while the second module consists in hands-on lab activity.

## Detailed program

- Fundamentals in EEG/MEG, including the electrophysiological bases of signals recorded in awake, sleep and pathological states, instrumentation, and experimental design.
  - Application of EEG/ERP technology in the study of the neural bases of cognition (Cognitive Electrophysiology).
  - New advances in EEG/ERP applications (e.g., Forensic Neuroscience and lies detection, Music Perception and Music therapy, Artificial intelligence, Brain Computer Interface, "Mind reading", Relaxation Techniques for Stress Relief (e.g. Yoga), Neurofeedback for ADHD treatment, Neuroaesthetics, Neuroeconomics, Political Neuroscience, Sexual gender studies, Racial prejudice, Consciousness detection in coma patients, Appreciation and aesthetic evaluation of brands/products, etc..).
  - Hands-on experience: tools and instruments needed to perform data analysis will be presented; furthermore, step-by-step processing of real data will be illustrated.
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- EEG recording of an awake participant during one or two selected paradigms among those discussed together. Final group discussion

## Prerequisites

This course requires a basic knowledge of Cognitive Neuroscience of the nervous system and its cognitive functions.

The understanding of textbook and scientific articles in English.

## Teaching methods

Frontal lessons with slides and audio/video presentations. Presentation and discussion of EEG/ERP/MEG data and research articles.

Practical activity in lab for experimental set up, recording and analysis of real data. Real data acquisition, application of EEG source reconstruction techniques.

Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.

## **Assessment methods**

**Practical tests and group discussion. Attendance is required.**

**Students learning will be assessed (directly or indirectly) during data discussion, case study analysis or hands-on experience, with questions pertaining issues addressed in class or during lab practical activity. Numerical grades will not be used but just a passing check, based on attendance and active interaction of students.**

## **Textbooks and Reading Materials**

**Zani A. & Proverbio A.M. (2003) The cognitive electrophysiology of mind and brain, Academic Press/Elsevier, New York. Forward by Michael Posner.**

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