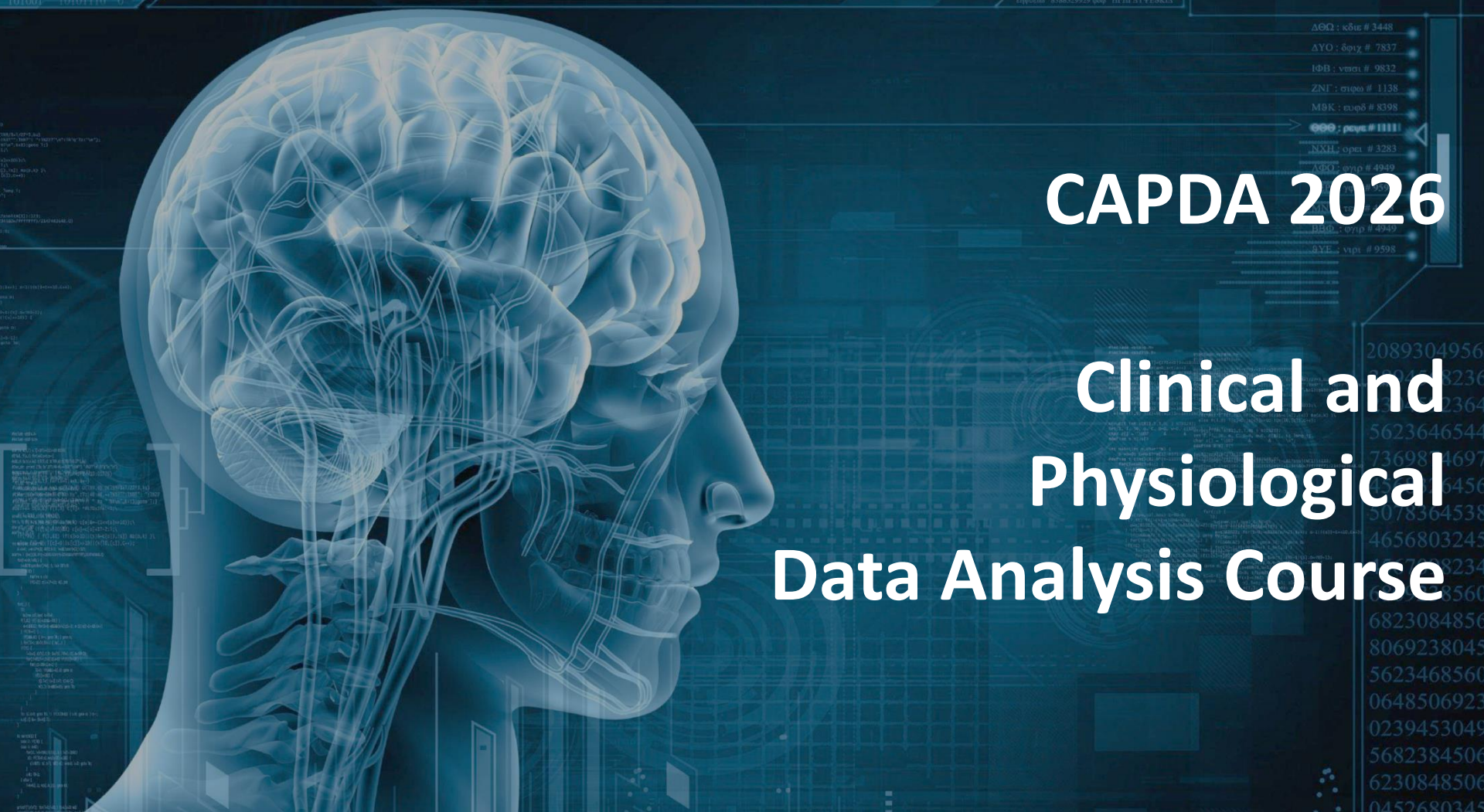




CAPDA 2026

Clinical and Physiological Data Analysis Course

31st August – 11th September 2026

**Centre for Biomedical Cybernetics
University of Malta, Msida, Malta**

Eligible as a DegreePlus extracurricular activity.



L-Università ta' Malta
Centre for Biomedical Cybernetics



University of Malta
MRI Research
Platform

We are excited to announce the 2026 edition of the Clinical and Physiological Data Analysis (CAPDA) course offered by the Centre for Biomedical Cybernetics.

This year's course covers a wide range of topics designed to provide a comprehensive understanding of clinical and physiological data acquisition and analysis, delivered by experts with practical experience in their respective fields.

This year's course will consist of sessions focused on:

- **Electroencephalography (EEG):** Fundamental theory and practical sessions, by Dr Natasha Padfield; and hands-on EEGLAB sessions by Dr Stefanie Türk.
- **Magnetic Resonance Imaging (MRI):** theoretical sessions including fundamentals, functional MRI, and diffusion MRI, practical sessions with MRI equipment, and MRI data analysis sessions, delivered by Dr Claude Bajada and Dr Maria Mora-Corral.
- **Signal Processing:** Fundamentals of data acquisition, signal analysis, and signal processing techniques, by Dr Ing. Nathaniel Barbara.
- **MATLAB Programming:** Programming for physiological data analysis, processing, and visualisation, by Dr Ing. Nathaniel Barbara.

This course is intended for:

- **Individuals with a clinical background** who are interested in delving further into the details of clinical and physiological signal and image acquisition, even with no prior technical experience.
- **Individuals with a technical background** who are looking to deepen their understanding of data acquisition, analysis and processing in the context of clinical and physiological data, from both theoretical and practical perspectives.
- Anyone interested in acquiring fundamental insights into the theoretical and practical aspects of clinical and physiological data analysis.

Applicants are free to mix and match the sessions on offer, according to their interests. Session packages are also offered at favourable rates.

The course is also recognised as a DegreePlus activity if a minimum of 16 hours of course content are attended.

Registration can be carried out online here:

www.um.edu.mt/cbc/forms/capda2026/form

Contact us on cbc@um.edu.mt with any queries.

EEG Fundamentals

Session Description	This theoretical session will cover the fundamental aspects of EEG signal analysis starting with a basic introduction on brain anatomy, physiology and electrical activity, followed by details on the steps involved in a typical EEG signal acquisition and analysis procedure. Signal conditioning, feature extraction techniques, and temporal and spectral characteristics of EEG data will also be explored.
Topics	• Introduction on the brain and brain activity • Modalities to record brain activity • EEG electrode placement • Referencing methods • EEG spectral characteristics • EEG temporal characteristics • Artefacts and artefact removal
Duration	4 hours
Lecturer	Dr Natasha Padfield Centre for Biomedical Cybernetics

EEG Practical

Session Description	This session consists of hands-on practical EEG recording sessions at the Biomedical Engineering Laboratory at the Faculty of Engineering. Participants will learn how to set up an EEG system and record data from participants. Through this session participants will become familiar with the different types of EEG setups that are nowadays available, as well as the practical considerations that have to be taken into account when recording EEG data.
Topics	• Hardware and software components of an EEG system • Electrode setup • Setting EEG system parameters • Recording EEG data • Checking quality of recorded signals • External triggers and markers • Artefacts in EEG data
Duration	3 hours
Lecturer	Dr Natasha Padfield Centre for Biomedical Cybernetics

EEGLAB

Session Description	This session is aimed at familiarising participants with the use of EEGLAB, an interactive software tool used for the analysis of EEG data. Participants will become acquainted with widely used EEG components including event-related potentials (ERPs), time-frequency power, and phase coherence, through the analysis and processing of actual EEG datasets. No prior programming or EEG data analysis experience is required.
Topics	• Introduction to EEGLAB • Importing and plotting EEG data • Pre-processing EEG data • Event-related potentials (ERPs) • Independent component analysis (ICA) • Time-frequency (TF) analysis • Computing and visualising TF power and inter-trial phase coherence
Duration	5 hours
Lecturer	Dr Stefanie Türk Inspire Foundation Centre for Biomedical Cybernetics

MATLAB

Session Description	This session will provide participants with an introduction to MATLAB, a programming software application that is widely used for the analysis and processing of biomedical signals and images. This session consists of hands-on laboratory sessions during which participants will become familiar with the MATLAB environment and will acquire basic MATLAB programming skills for signal processing and data visualisation purposes.
Topics	• Introduction to MATLAB • Working with vectors, matrices and multidimensional arrays • Scripts and functions • Importing and exporting data • Plotting and visualising data • Conditional statements • Basic physiological data analysis • Statistical tests using MATLAB
Duration	8 hours
Lecturer	Dr Ing. Nathaniel Barbara Centre for Biomedical Cybernetics

MRI Fundamentals

Session Description	This theoretical session aims to build a solid foundation in understanding the principles and applications of Magnetic Resonance Imaging (MRI) in neuroscience. Participants will explore the basics of brain anatomy and function, the science behind Nuclear Magnetic Resonance (NMR), and the techniques involved in generating MRI images. The session will also delve into functional MRI (fMRI) and Diffusion MRI (dMRI), highlighting their unique contributions to brain research.
Topics	• Brain anatomy and function • Basic principles of Nuclear Magnetic Resonance (NMR) • Contrast mechanisms and image resolution • Image reconstruction • Functional MRI (fMRI) • Diffusion MRI (dMRI)
Duration	3 hours
Lecturer	Dr Claude Bajada Faculty of Medicine and Surgery

MRI Practical

Session Description	This practical session offers a hands-on experience in an MRI facility, designed to complement the theoretical knowledge gained in the MRI Fundamentals module. Participants will tour the MRI facility, observe the scanning process, and see real-time applications of the concepts discussed in the theoretical section. This immersive experience aims to bridge the gap between theory and practice, providing a comprehensive understanding of MRI technology and its applications in brain imaging.
Topics	• MRI facility tour • Equipment and setup overview • Safety protocols and procedures • Recap of key ideas from the theoretical module • Observation of scanning process
Duration	2 hours
Lecturer	Dr Claude Bajada Faculty of Medicine and Surgery

Functional MRI

Session Description

This session is aimed at clinicians, neurologists and neurosurgeons, but also radiographers and other interested professionals, who wish to develop a principled understanding of fMRI without delving into mathematical physics. Participants will explore what the BOLD signal represents, how fMRI paradigms are designed and interpreted, and how activation maps are generated. Emphasis will be placed on recognising the limitations and potential pitfalls of fMRI when applied in clinical settings such as presurgical mapping.

Topics

- The BOLD signal
- fMRI paradigm design and acquisition
- From raw data to activation maps
- Clinical applications of fMRI
- Limitations and pitfalls in clinical practice
- Neurovascular uncoupling and other confounds

Duration

2 hours

Lecturer

Dr Claude Bajada
Faculty of Medicine and Surgery

Diffusion MRI

Session Description

This session is aimed at clinicians, neurologists and neurosurgeons, but also radiographers and other interested professionals, who want to build a solid, principles-based understanding of diffusion MRI (dMRI) without engaging with the underlying mathematical physics. The session will place strong emphasis on the known limitations of dMRI and tractography, especially when these techniques are used to inform surgical planning or diagnostic reasoning.

Topics

- Principles of diffusion-weighted imaging
- Diffusion metrics: what they measure and what they do not
- Tractography: how pathways are reconstructed
- Clinical applications of diffusion MRI
- Limitations of tractography in clinical practice
- Interpreting diffusion data critically

Duration

2 hours

Lecturer

Dr Claude Bajada
Faculty of Medicine and Surgery

MRI Data Analysis

Session Description

This analysis session is designed to equip participants with practical skills in handling and analysing MRI data. In this session, participants will work with a real dataset, learning the essential steps of data management, pre-processing, and analysis.

This hands-on experience will provide participants with a solid foundation in data analysis techniques, preparing them to conduct their own research using MRI data.

Topics

- Introduction to the MRI Dataset
- Overview of the provided MRI dataset
- Loading and organising MRI data
- Data pre-processing
- Data analysis

Duration

5 hours

Lecturer

Dr Maria Mora-Corral
University of Malta MRI Platform (UMRI)

Signal Processing

Session Description

This session will introduce participants to fundamental signal processing concepts that are of relevance for physiological signal analysis. The steps involved in the analogue-to-digital conversion of physiological signals, together with the fundamental technical aspects that have to be considered when analysing signals in the time and frequency domain, will be covered.

An overview of more advanced signal analysis techniques is also included.

Topics

- Analogue to digital conversion
- Analogue signal filtering
- Digital signal filtering
- Temporal analysis
- Spectral analysis
- Interaction measures
- Classification methods

Duration

7 hours

Lecturer

Dr Ing. Nathaniel Barbara
Centre for Biomedical Cybernetics

Programme

	Mon 31 st Aug	Tue 1 st Sept	Wed 2 nd Sept	Thu 3 rd Sept	Fri 4 th Sept	Sat 5 th Sept
09:30 – 11:30 (2 hrs)	EEG Fund. I (EBCL)	EEG Fund. II (EBCL)	MATLAB I (EBCL)	Sig. Proc. II (EBCL)	Sig. Proc. III (EBCL)	MRI Practicals (MRI3) <i>multiple 2-hour sessions with small groups</i>
11:30 – 13:00						
13:00 – 16:00 (3 hrs)	MRI Fund. (EBCL)	Sig. Proc. I (EBCL)		MATLAB II (EBCL)	MATLAB III (EBCL)	

	Mon 7 th Sept	Tue 8 th Sept	Wed 9 th Sept	Thu 10 th Sept	Fri 11 th Sept
09:30 – 11:30 (2 hrs)	Functional MRI (EBCL)	<i>Public Holiday</i>	EEGLAB I (EBCL)	Diffusion MRI (EBCL)	MRI Data Analysis I (EBCL)
11:30 – 13:00					
13:00 – 16:00 (3 hrs)	EEG Prac. (BE Lab)			EEGLAB II (EBCL)	MRI Data Analysis II (EBCL)

EBCL
Computer Lab,
Engineering Building,
UM

BE Lab
Biomedical
Engineering Lab,
Engineering Building,
UM

MRI3
MRI 3, Level -1,
Mater Dei Hospital

Online registration: www.um.edu.mt/cbc/forms/capda2026/form/

Session	Hrs	Fee
EEG Fundamentals	4 hrs	€60
EEG Practical	3 hrs	€75
EEGLAB	5 hrs	€75
MRI Fundamentals	3 hrs	€45
Functional MRI	2 hrs	€30
Diffusion MRI	2 hrs	€30
MRI Practical	2 hrs	€50
MRI Data Analysis	5 hrs	€75
Signal Processing	7 hrs	€105
MATLAB	8 hrs	€120

Package	Fee
EEG Package <i>EEG Fundamentals, EEG Practical, EEGLAB, Signal Processing, and MATLAB sessions.</i> 27 hrs - recognised as a DegreePlus activity.	€430
MRI Clinical Package <i>MRI Fundamentals, Functional MRI, Diffusion MRI, and MRI Data Analysis sessions.</i> 12 hrs	€160
MRI Full Package <i>MRI Fundamentals, Functional MRI, Diffusion MRI, MRI Practical, MRI Data Analysis, Signal Processing, and MATLAB sessions.</i> 29 hrs - recognised as a DegreePlus activity.	€430
Complete Package <i>All sessions.</i> 41 hrs - recognised as a DegreePlus activity.	€620

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