## Testi in italiano

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### Contenuti (Dipl.Sup.)

The Clinical Neuroimaging course is divided into two parts: i) the first part of the course is intended to provide an overview of the basic concepts, techniques and tools in the field of brain imaging and brain mapping; ii) the second part aims at introducing application of neuroimaging techniques in relevant neurological diseases:

**First part:** Physics underlying brain imaging - prof. Renata Longo (14 hours)
- X-ray Computed Tomography: basic principles and recent developments
- Magnetic Resonance imaging (MRI): imaging techniques and T1 and T2 relaxation
- Functional MRI (fMRI): physical and physiological basis of BOLD contrast
- fMRI experimental design and statistical analysis
- Diffusion Weighted Imaging (DWI) and Diffusion Tensor Imaging (DTI): physical basics and imaging techniques
- DTI fiber tracking for neurons bundles studies
- MRS localised in-vivo NMR spectroscopy
- Radioisotopes imaging: single photon emission tomography (SPECT) and positron emission tomography (PET)
- Introduction to biological effects of ionizing radiation

**Second part:** clinical application of neuroimaging techniques - prof. Maja Ukmar (14 hours)
- CT and MRI anatomy of CNS
- CT perfusion: technique and main application in CNS pathologies
- MR perfusion: technique and main application in CNS pathologies
- Functional MRI (F-MRI): application in clinical setting and and in some research setting
- Diffusion weighted imaging (DWI) and Diffusion tensor imaging (DTI): current application in clinical setting and future perspectives
- MR spectroscopy in neuroradiology: main clinical application
- Nuclear medicine technique in neuroradiology: SPECT and PET. Main application and comparison with CT and MRI conventional and advanced technique.

Tutorials of fMRI & DTI (6 hours)

**Testi di riferimento**
The slides discussed during the lectures will be available in Moodle. Additional materials (review papers, links to relevant websites etc) are in Moodle. Specific papers will be provided upon request.

**Obiettivi formativi**
The aim is to provide the students with the basic knowledge necessary to interpret and design imaging experiments. Moreover the second aim is to provide the students with the basic knowledge on the main scientific and clinical relevance of advanced neurofunctional technique.

D1 - Knowledge and understanding:
At the end of the course, students will have to demonstrate knowledge and understanding of the key concepts and of the fundamental applications the modern techniques used in human brain mapping and in neuroimaging.

D2 - Applying knowledge and understanding:
By the end of the course the students will be able to:
- design and perform an MRI study for brain mapping
- to choose the most suitable neuroimaging approaches for a given scientific question
- to understand which are the clinical values and research values of advanced MR and CT technique

D3 - Making judgments:
By the end of the course:
- the students will be able to to read critically a scientific paper that makes use of the neurofunctional techniques presented in the course;
- students will have to demonstrate that he/she has not only acquired knowledge and concepts but also his/her ability to apply them for the analysis of the results obtained during the fMRI/DTI exercises done at cattinara hospital.
- the student will be able to understand which is the added value of an advanced technique and whih are the limits in clinical setting and in research one

D4 - Communication skills:
The requested written reports about MRI experiments and the oral examination will encourage the students to develop scientific writing abilities and oral communication skills, using, effectively, appropriately and with specific language, the concepts learned in the course.

D5 - Learning skills:
By the end of the course, the students will be able to read autonomously the scientific literature using advanced neuroimaging techniques and their applications.

**Metodi didattici**
- Lectures
- Small group tutorials at the MRI unit

**Modalità di verifica dell'apprendimento**
To be admitted to the exams the tutorial group of the candidate must have submitted the written report.
The final exam starts from the verbal discussion of the group report and go on with discussion about the topics treated in the course and takes 20-30 minutes on average. The grading system applied is: (18-24): sufficient or fair knowledge of the subject, adequate mastery of the technical language (25-27): good or very good knowledge of the subject, technical language proficiency, essential ability to connect the themes addressed during the course (28-30 with honours): excellent knowledge of the subject and technical language proficiency, autonomous critical and analytical skills, and ability to apply acquired knowledge to concrete scenarios.
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This course explores topics closely related to one or more goals of the United Nations 2030 Agenda for Sustainable Development (SDGs)

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Testi in inglese

English

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