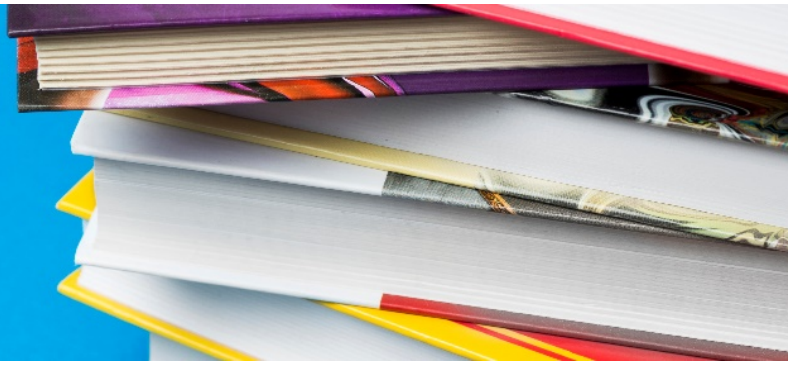
TEL AVIV UNIVERSITY אוניברסיטת תל אביב

Full Syllabus



Course Title

An Introduction to Magnetic Resonance Imaging (MRI)

Lecturer

Dr. Noam Ben-Eliezer

Semester

B

Course requirements

Final grade components

Exam 70 %
Exercises 30 %

Course schedule

Class no. / Date	Subject and Requirements (assignments, reading materials, tasks, etc.)

This course provides a window into the complex and wonderful world of Magnetic Resonance Imaging.
Over the last two decades MRI has become the foremost leading imaging modality worldwide, being used for diagnosis and prognosis of all types of pathologies, and even guided-treatments.
This course will cover the physical principle of MRI, and the diverse range of imaging protocols and applications using MRI. Amongst the topics that will be tought, we will discuss biophysical models which combine anatomy, physiology and physics at the macro- and microscopic levels, basic signal-processing techniques, optimization techniques, and more.

Specifically, we will cover the following set of topics:

1. Physical basis of nuclear magnetic resonance phenomenon, spin physics, basic magnetism, classic and quantum description, Bloch equations, Relaxation mechanisms (T1,T2,T2*,T1rho), chemical shift, and spectroscopy.
2. MR imaging protocols and clinical applications, FT reconstruction, k-space, full and partial sampling of k-space, accelerated imaging protocols.
3. Theoretical definition of spatial resolution and point spread function.
4. Radiofrequency (RF) pulses: use, and design, 1D, 2D and nD RF pulses.
5. Specific applications:
   - fMRI
   - Diffusion MRI
   - Perfusion MRI
   - Angiography
   - Use of contrast agents
   - Dynamic contrast enhanced MRI
6. Parallel imaging
7. Tissue interactions and safety
8. Signal to noise ratio (SNR): definition and analysis

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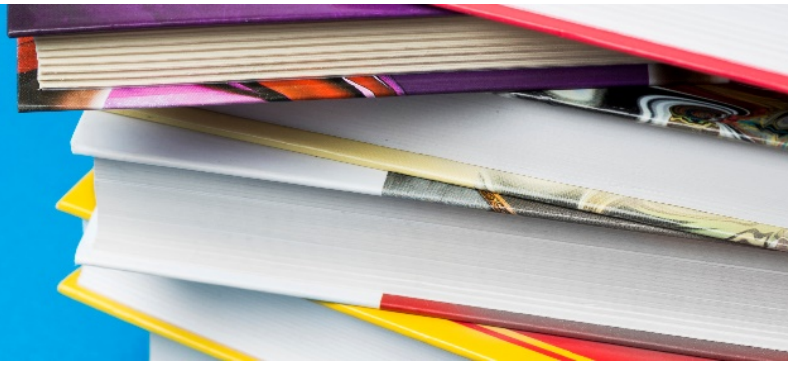

	Required course reading
	None
	Optional course reading
	None
	Comments
	None