האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Advanced Medical Imaging and Research - 94846

Last update 14-09-2021

HU Credits: *2*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *Bio-Medical Sciences*

Academic year: *0*

Semester: *2nd Semester*

Teaching Languages: *Hebrew*

Campus: *Ein Karem*

Course/Module Coordinator: *Prof. Rachel Katz-Brull*

Coordinator Email: *rkb@hadassah.org.il*

Coordinator Office Hours: *By e-mail*

Teaching Staff:

Prof Rachel Katz-Brull,
Dr. Alexandre Chicheportiche

Course/Module description:
The course will describe current medical imaging in clinical and research use, emphasizing the various methodologies and their applications

Course/Module aims:
1) To learn about the variety of methods and technologies which exist today for non-invasive imaging of the body and brain; 2) To learn about the multiple cellular and tissue characteristics that can be monitored and quantified by non-invasive imaging; 3) To stimulate thoughts towards the variety of biological and medical research questions that can be tackled using imaging of human subjects as a dominant or complimentary tool for current research questions.

Learning outcomes - On successful completion of this module, students should be able to:
To know the various medical imaging technologies and their applications.

Attendance requirements(%):
None

Teaching arrangement and method of instruction: Lectures and self learning

Course/Module Content:
1. Introduction to medical imaging with emphasis on MRI
2. Contrast agents used in medicine, directions in future contrast agents development
3. Molecular Imaging Probes, Molecular Imaging, MRI, PET, SPECT
4. Contrast mechanisms in medical imaging by MRI: FLAIR, T1, T2
Contrast generation on X-ray imaging, fluoroscopy, CT, US
5. Functional MRI use in brain function research, contrast mechanism by blood oxygenation level – BOLD
6. Brain imaging in neurodegenerative diseases. Spectroscopy of the brain - MRS
7. Body imaging – imaging of the fat/water ratio in fatty liver. Phase contrast imaging, clinical examples. US – clinical examples.
8. Imaging of cancer tumors, characterization of tissues by imaging, DCE-MRI, clinical examples.
9. Physical principles of MRI, read and phase encoding, artifacts
10. Spin echo and gradient echo sequences

11. Fast imaging, current approaches and research approaches, diffusion as a contrast mechanism, diffusion weighted imaging (DWI), Diffusion tensor imaging (DTI), imaging of neuronal tracts by DTI
12. Hyperpolarized MRI molecular imaging, multinuclei spectroscopy
13. Molecular imaging by PET
14. Pathologic metabolic pathways and the means to observe them non-invasively by hyperpolarize MRI and PET.

Required Reading:
None

Additional Reading Material:
None

Course/Module evaluation:
End of year written/oral examination 100 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
Open examination.

Some of the classes will be given in the format of Active Learning Units.

All of the frontal lectures (in class or in Zoom) will be recorded.

Some of the course lectures are frontal and some are for self learning (regardless of COVID-19).

The course is very suitable for self learning.