BYM 513E ADVANCED TOPICS IN BIOMED.ENG.
"Inverse Problems in Medical Imaging" CRN: 24771
Spring 2022 - Course Syllabus

Instructor: Prof. Ender M. Ekşioğlu, eksioglue at itu.edu.tr, Office: 2401
Webpage: ninova, cloud folder
Prerequisite: A good background in calculus, linear algebra, statistics, signal processing, programming in MATLAB.

Textbook:
Class notes will be available.

Some reference texts:
Welcome to Inverse Problems and Imaging,
https://tristanvanleeuwen.github.io/IP_and_Im_Lectures/intro.html
Inverse Problems, S.M. Tan and Colin Fox
Introduction to Inverse Problems in Imaging, Bertero & Boccacci, IoP, 1998
Computational Methods for Inverse problems, C.Vogel SIAM, 2002
Inverse Problems Theory, Albert Tarantola
Discrete Inverse Problems: Insight and Algorithms, Per Christian Hansen

Academic Integrity: Homework, examinations and the term project are expected to be the sole effort of the student submitting the work. Students found guilty of cheating will receive a zero grade for the concerning homework, report or exam.

Grading criteria:	**Percent of final grade**
Homework and Quizzes:	10%
Midterm Exam:	25%
Term project:	35%
Final exam (cumulative):	30%

Topics
1. Inverse problem introduction
2. Discrete Inverse Problems and Regularisation
3. Linear inverse problems in function spaces
4. Review of probability theory, a statistical perspective on inverse problems
5. Examples of inverse problems: Image denoising; Image deblurring; X-ray tomography; Emission tomography; Magnetic resonance imaging.
6. Variational formulations for inverse problems
7. Numerical optimisation for inverse problems
8. Regularization parameter selection methods

Information about the Term Project

- ✓ Part of your final grade will be based on a research project.
- ✓ You should have chosen a topic (paper) and confirmed the topic with me by **the third week of classes** (let me know of your choice as soon as possible before this date (so as to make sure everyone works on a different topic-paper)).
- ✓ The due date for the project proposal is **the fourth week of classes**. In the project proposal, you need to describe in one page your planned project content.
- ✓ The due date for the progress report is **the ninth week of classes**. In the progress report, you need to describe, in at least three pages, what you have done so far.
- ✓ The due date for the final report is **the last week of classes**. The final report is a detailed report, which describes the problem in your words, the work you have done and the problems you encountered while implementing the method etc.
- ✓ Proposal, progress report and presentations will all affect your project grade.
- ✓ **More details about the project** are given in an additional document.