EUROPEAN SCHOOL OF ANTENNAS

MICROWAVE IMAGING AND DIAGNOSTICS: THEORY, TECHNIQUES AND APPLICATIONS

1 - 5 February 2021, Napoli, Italy (online)



Lecturers

Dr. L. Crocco, IREA-CNR (IT)
Prof. T. Isernia, Università Mediterranea di Reggio Calabria (IT)
Prof. A. Massa, Università di Trento (IT)
Dr. I. Catapano, IREA-CNR (IT)
Prof. X. Chen, National University of Singapore (SG)
Dr. B. Fuchs, IETR-CNRS (FR)
Prof. J. Lo Vetri, University of Manitoba (CA)
Dr. M. Salucci , Università di Trento (IT)
Prof. F. Vipiana, Politecnico di Torino (IT)

Main Facts

Course Coordinators:
Dr. L. Crocco, IREA-CNR (IT)
Prof. T. Isernia, UNIRC (IT)
Prof. A. Massa, UNITN (IT)

Course location:
The course will be held on-line

Registration fee:
250€ universities and non-profit
440€ for business companies

Credits: PhD students 3 ECTS

For registration and details:
http://esoa-mwi.irea.cnr.it/
esoa2020@irea.cnr.it

The exploitation of electromagnetic field data as a sensing tool paves the way to a number of interesting engineering applications: antenna testing and characterization, biomedical diagnostics, humanitarian demining, archeological prospection, through-the-wall imaging, non-destructive testing of transport infrastructures and buildings, and many others.

This course, after reviewing fundamental equations and main difficulties of inverse problems, will focus on classical and recently introduced solution procedures and algorithms, discussing capabilities, limitations, and perspectives of both approximate and 'exact' reconstruction methods.

Applicative examples, including exercises, laboratory activities and lessons regarding specific applications, will corroborate the developed concepts.

The course is primarily conceived for Doctoral students and researchers with an engineering or physics background.

Course Topics

The course starts by reviewing the basic principles of inverse source and inverse scattering problems together with their inherent difficulties. The most popular qualitative and quantitative solution methods are then presented along with the emerging paradigms such as compressive sensing and machine-learning. A series of lectures is dedicated to real-world applications of inverse source and inverse scattering methods. The course is integrated with interactive lecturers providing a hands on experience with some processing tools.

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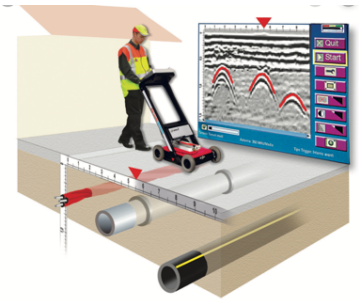

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Detailed Course Breakdown

Introduction and mathematical formulation

Inverse Source Problems

- Radiated field properties
- Regularization techniques

Inverse Scattering Problems

- Scattered field properties
- Linearized methods
- Qualitative imaging methods
- Full-wave imaging

Emerging topics and methods

- Compressive sensing for inverse problems
- Machine Learning based approaches for inverse scattering

Applications

- Antenna Diagnostics and Characterization
- Subsurface sensing / Ground Penetrating Radar
- Through-the wall imaging / Security
- Biomedical imaging
- Industrial applications: food contamination imaging

Interactive Lectures

- Tools for inverse source problems
- Linear and qualitative microwave imaging