Laurea Magistrale
Atmospheric Science and Technology (LMAST)

SUBJECT TITLE	Radar image processing
TEACHER NAME(S)	Debora Pastina
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Teacher meeting	By appointment
Teacher office address	Univ. of Rome "La Sapienza", Rome, Via Eudossiana 18, DIET – room 217
DISCIPLINE (SSD)	ING-INF/03
Semester (1-4)	1
Credits (CFU/ECTS)	6
Lecture hours (h)	60
Prerequisite and learning activity	Basic knowledge of radar techniques and systems, signal theory.
Teaching language and method	Italian
Assessment method	The exam requires the development of an homework that requests the implementation via the MatLab software of the techniques considered in the course from a theoretical point of view and the analysis of the obtained results. The examination consists in a talk discussing the implemented procedures and the obtained results using for the talk a presentation (slides collection) describing the work carried out.
SUBJECT WEBSITE	http://infocom.uniroma1.it/rrsn/wiki/Main/ElaborazioneDelleImmaginiRadar

OBJECTIVES

The principles of the Synthetic Aperture Radar (SAR) are introduced and the main applications exploiting SAR images are described. The signal processing techniques required for the focusing and autofocusing of the SAR images are cosidered. The image processing techniques to extract the information out of the SAR images are considered in details. Principles for SAR systems design are also provided.

OUTCOMES (Dublin descriptors: knowledge, understanding, explain, skill, ability)

At the end of the class, the student knows the main techniques for the focusing of SAR images and for the extraction of information from them. He/she understands the basics of SAR system design and is able to appropriately select their main parameters. Moreover the development of the homework allows the student to acquire the knowledge required for the implementation of signal processing and data processing techniques.

PROGRAM CONTENT

Imaging radar systems from air- and space-based platform.

SAR processing:
- principles and focusing techniques for synthetic aperture radar (SAR)
- STRIPMAP, Spotlight SAR, SCANSAR acquisition modes
- auto focusing techniques
- geometric distortion correction
- SAR images of moving targets
- principles and processing techniques for the formation of ISAR (Inverse SAR) images of moving targets

Extraction of information from SAR images:
- statistical description of speckle noise
- despeckling techniques
- segmentation techniques
- recognition and classification of extended targets
- detection of changes and multi temporal patterns
- information extraction from polarimetric and e multifrequency images

REFERENCES AND MATERIAL

"Understanding SAR images", C.J. Oliver, S. Quegan, Artech House, 2004,
Selected chapters from international literature (books and papers) documents suggested by the teacher
Supplementary material (slides) available on the web site web