REMOTE SENSING COURSE

Short Description
This course focuses on the grounding principles and practice of optical remote sensing and digital image processing in environmental remote sensing.
Timetable
Course runs for 20 hours (1 week); 50% lectures and 50% practical
Course Aims
This course aims to provide PhD students with an understanding of the grounding principles and practice of optical, thermal and radar remote sensing and digital image processing.
Intended Learning Outcomes of Course
By the end of this course, students will be able to:

Subject specific learning objectives
• explain the scientific basis of optical remote sensing;
• carry out the most commonly used Digital Image manipulation, and explain their uses and applications;
• explain examples of the use of remote sensing data;
• manipulate spectral data;
• apply remote sensing techniques in order to generate environment descriptors.

Transferable skill-learning objectives
• use Virtual machine and Remote sensing software to carry out commonly-used image processing tasks.
Minimum Requirement for Award of Credits
Students must accomplish at least 80% of the course's lectures and practical.
Feedback
Student performance in practical classes will receive feedback from the course tutor.
Hardware requirements
PC or laptop required for practical.

Topics:
1. General concepts: Remote sensing (RS) physical principles; Raster and vector images; spectral, radiometric, geometric and temporal resolutions.
2. Basic laws: Planck's law; Stefan-Boltzmann's law; Wien's law; black and grey bodies definition; emissivity; Kirchhoff's law.
3. Georeferencing: Polynomial technique; ground control points; Transformation order; resampling techniques.
4. Radiometric calibration and atmospheric correction: Spectral radiance calibration; Spectral reflectance calibration; Atmospheric correction; Surface Temperature calibration.
5. Water column correction: Radiative transfer equation; Lyzenga's depth invariant; Underwater vegetation mapping.
6. Vegetation indexes: Soil spectral signature; vegetation spectral signature; Slope based and distance based vegetation indexes.
7. Classification: Unsupervised classification**:** ISODATA; Supervised Classification: minimum distance; parallelepiped; maximum likelihood. Post-classification: Confusion matrix; Omission and commission errors.
8. Hydrology: soil water content estimation; actual evapotranspiration.
9. Water quality: Sea Surface temperature; Chlorophyll concentration; Total suspended solid concentration
10. Interferometry: digital surface model retrieval; Displacement measuring interferometry.

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Antonino Maltese received the Master's degree in civil engineering and the Ph.D. degree in hydraulic and environmental engineering from the University of Palermo, Palermo, Italy, in 1999 and 2008, respectively. He is currently a Scientist with the University of Palermo, Department of Civil Engineering, Environmental, Aerospace of Materials, Palermo (Italy). His research interests include remote sensing applied to agro-hydrology (modelling actual evapotranspiration of the soil vegetation system, modelling surface soil water content) and remote sensing applied to water bodies (mapping submerged vegetation and water quality). Dr. Maltese is a Conference Chair and Editor of the Proceedings of the "Remote Sensing for Agriculture, Ecosystems, and Hydrology" Conference within the Symposium "SPIE Europe Remote Sensing" since 2009. He was the recipient of the Tison Award 2015.