COURSE OUTLINE

(1) GENERAL

SCHOOL	Economy, Management and Informatics		
ACADEMIC UNIT	Department of Informatics and Telecommunications		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE		**SEMESTER**	
COURSE TITLE	Fundamentals of Remote Sensing		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Courses			
Practical Exercises			
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	TBA		

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(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course is introductory to Remote Sensing physics, image analysis, and interpretation. It deals with sensor technologies and image handling in support to Space Applications and Earth Observation Systems development. Upon successful completion of the course, students will be able to:

- Describe the components of a modern remote sensing system.
- Differentiate between the different operational sensors.
- Identify the appropriate methodologies and tools linked with the image analysis/processing levels (e.g. image space reduction, and fusion, feature enhancement and extraction, etc).
- Recognise the electromagnetic spectrum physics and interactions with land & atmosphere
- Categorise the appropriate satellite systems/methods to use per application area.
- Explain the basics of SAR sensor physics, and its implementation in Remote Sensing.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Team work.
- Adapting to new situations.
- Decision-making.

(3) SYLLABUS

1. Introduction to Remote Sensing:
- Components of a Remote Sensing System
- Existing imaging platforms (satellite, UAV, aerial) and image typology (VHR, HR, MR, LR), multi-hyper spectral imagery
- Radiometric, spectral, and spatial characteristics of state-of-the-art and planned sensor systems
- Sensor systems vs application areas
- Satellite system operators, existing GSs, image data archives, and access modes

2. Radiative transfer in the atmosphere:
- Transmission characteristics of microwave, infrared, and visible light in clear days and in cloud/fog/precipitation
- Passive and active remote sensing techniques
- Atmospheric remote sensing technology
- Earth data exploration

3. Image analysis and image processing methods:
- Image radiometric calibrations, and enhancements
- Image geometric corrections, rectification/ortho-rectification,and triangulation methods
- Band image arithmetics & spectral features derivation (e.g. spectral indices)
- Basics on image classification methods and object creation (e.g. single vs multi-date, supervised vs unsupervised, pixel vs object oriented, feature extraction and pattern recognition)

4. SAR Remote Sensing
- Introduction to SAR remote sensing principles
- Electromagnetic wave theory
- Scattering theory and decomposition techniques
- SAR interferometry, polarimetric SAR interferometry
- SAR based bio/geophysical parameter estimation

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(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Use of ICT teaching - Communication with students
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	***Activity Semester workload*** 39 Lectures 13 Laboratory practice/ Tutorials/Interactive teaching 65 Practical exercises 83 Studying 200 Course total

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final examination (~50%) consisting of - Problem solving questions - Open-ended questions. - Theory understanding short questions. Project examination and presentation (~50%)

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(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Manual of Remote Sensing, Volume 3, Remote Sensing for the Earth Sciences, 3rd Edition Andrew N. Rencz (Editor), Robert A. Ryerson (Editor), ISBN: 978-0-471-29405-4, 728 pages March 1999
- Manual of Remote Sensing, Volume 4, Remote Sensing for Natural Resource Management and Environmental Monitoring, 3rd Edition, Susan Ustin, ISBN: 978-0-471-31793-7, 768 pages, May 2004
- ampbell, J. B. (1996) Introduction to Remote Sensing (2nd Ed), London:Taylor and Francis.
- R. Harris, 1987. "Satellite Remote Sensing, An Introduction", Routledge & Kegan Paul.
- Jensen, J. R. (2000) *Remote Sensing of the Environment: An Earth Resource Perspective*, 2000, Prentice Hall, New Jersey.
- Jensen, J. R. (2005, 3rd ed.) *Introductory Digital Image Processing*, Prentice Hall, New Jersey. (Companion to above, available online at http://www.cla.sc.edu/geog/rslab/751/index.html
- Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2004, 5th ed.) *Remote Sensing and Image Interpretation*, John Wiley, New York.
- Mather, P. M. (1999) *Computer Processing of Remotely-sensed Images*, 2nd Edition. John Wiley and Sons, Chichester.
- W.G. Rees, 1996. "Physical Principles of Remote Sensing", Cambridge Univ. Press