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	Space Environment		
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			
Project			
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 covers solar, solar-terrestrial physics and space weather. It deals with the characteristics and the dynamics of the solar driver and the terrestrial magnetosphere and ionosphere, as well as with the technology employed to explore and monitor these physical systems. Upon successful completion of the course, students will be able to:

- Describe the key elements of the Sun-Earth interaction and of the geospace particle and electromagnetic environment.
- Differentiate between distinct collective processes of energy conversion, involved in the transfer of magnetic energy of the Sun to kinetic energy of geospace plasma.
- Categorize and assess the appropriate remote sensing and in situ instrumentation and techniques to be applied for monitoring solar and geospace dynamics.
- Compare and assess various aspects and options of space systems (i.e. different types of spacecraft, orbits, propulsion methods, etc).
- Formulate and organize the requirements of space missions aimed at specific targets.
- Design mission strategies for exploring and/or monitoring particular aspects of Sun-Planet connection and Space Weather.

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

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(3) SYLLABUS

1. The Sun as the driver of space environment dynamics and space weather
- Introduction to the Sun and its basic structure, Solar radiation
- Solar Dynamo-produced Magnetic Fields, Solar cycle and activity,
- Photosphere: Sunspots, Chromosphere: Prominences. Filaments, Jets
- Corona: Loops, Flares, Holes, Mass ejections, Heating of the Solar Corona
- The Solar Wind
- The Heliospheric Current Sheet, The Solar Sector Structure
- The Heliosphere, Heliopause and Termination Shock
- The Sun as a Rosette Stone in Astrophysics
- Solar Missions.

2. Geospace environment and dynamics
- Charged particle motion in magnetic and electric fields
- Structure and plasma populations of the magnetosphere
- The Earth's magnetic field
- Types of geomagnetic activity, geomagnetic indices
- Magnetic storms and magnetospheric substorms
- Polar aurora
- Van Allen radiation belts and ring current
- Magnetosphere-ionosphere coupling
- Magnetospheric missions

3. Space weather: Physics and effects
- Solar energetic particles
- Relativistic electrons in geospace
- Space Situational Awareness
- Space debris and Near Earth Objects (NEO)
- Space weather damage to spacecraft components
- Space weather biological effects
- Societal impacts of space weather
- Ground effects of space weather, Geomagnetically induced currents

4. Space systems
- Space mission design
- Spacecraft classification
- Launch and propulsion, Gravitational assist
- Orbital mechanics, Spacecraft orbits
- Attitude control
- Space power systems

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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***
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 (100%) consisting of - Problem solving questions - Open-ended questions. - Theory understanding short questions.

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(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Αστροφυσική Πλάσματος, Κανάρης Τσίγκανος, ISBN 978-960-91748-2-4, Αθήνα 2015
- Εισαγωγή στη Θεωρητική Μηχανική, Κανάρης Τσίγκανος, ISBN 9609174817, Εκδόσεις Σταμούλη, Αθήνα 2004
- Solar and Astrophysical MHD Flows, Kanaris Tsinganos (ed.), Kluwer, 1996, ISBN 978-94-009-0265-7
- Space Storms and Space Weather Hazards, Ioannis A. Daglis (ed.), Springer, 2001, ISBN 9789401009836
- Effects of Space Weather on Technology Infrastructure, Ioannis A. Daglis (ed.), Springer, 2004, ISBN 9781402027543
- Space Weather – Physics and Effects, Volker Bothmer and Ioannis A. Daglis (ed.), Springer, 2007, ISBN 9783540345787
- Fundamentals of Space Systems, Vincent L. Pisacane and Robert C. Moore (ed.) Oxford University Press, 1994, ISBN 0195074971

- Related academic journals:

- Journal of Geophysical Research – Space Physics
- Annales Geophysicae
- IEEE Transactions on Plasma Science

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