COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Computer Engineering & Informatics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NE320	**SEMESTER**	5,7,9
COURSE TITLE	Information Transmission Systems		

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**
Lectures and tutorials	3	3
Laboratory exercises	2	2
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 Skills development
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.ceid.upatras.gr/el/undergraduate/courses/systimata-metadosis-pliroforias https://eclass.upatras.gr/courses/CEID1108/

(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*

The course consists of two parts. Optical fiber-optic transmission systems are analyzed in Part A, while in B part basic microwave transmission concepts and antennas. For Part A, the student who successfully completes the course can understand:

(1) The basic theory of optic waveguide
(2) Basic principles of fiber optic transmission systems,
(3) Principles and specifications of optical transmitters and receivers.
(4) Types and uses of fiber optic fibers (single mode and multi-mode fibers)
(5) Power and gain characteristics of erbium doped fiber amplifiers (EDFA).
(6) Passive optical modules and their uses in fiber optic systems
(7) Power budgets in fiber transmission systems.

Part B analyzes basic antenna concepts and signal propagation in the atmosphere. On this subject, the student who successfully completes the course can understand:

(1) The Hertz dipole.
(2) antenna radio coverage, directionality, gain, resistance and effective height.
(3) The composition of radiation patterns and principles of array design.
(4) Reciprocity theorem of in electromagnetic theory.
(5) Equivalent receiver circuit.
(6) Electromagnetic wave propagation phenomena in transmission lines and adaptation for optimal power transfer

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…*
	…….

Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas

(3) SYLLABUS

A. Lectures and Tutorials

- An introduction to Radio Physics
- A brief review of the electromagnetic wave
- Introduction in Optical fibers
- Types of optical fibers
- Propagation phenomena in optical fibers
- Dispersion in single and multi mode optical fibers
- Fiber losses
- Passive optical modules and their uses in fiber optic systems
- Optical Filters and Power Couplings
- Basic of optical transmitters
- Laser and LED characteristics
- Basic of optical receivers
- Common photodetectors
- Receiver design and receiver noise
- Receiver sensitivity – BER
- Lightwave systems
- System architecture and power budgeting
- Design guidelines
- Sources of power penalty
- Basic concepts of Optical Amplifiers
- Gain spectrum of EDFA
- Amplifier Noise and gain characteristics
- Isotropic sources
- EM wave propagation phenomena
- Cables and waveguides
- Antennas & radiation patterns
- Radiation field, directionality and antenna gain
- Types of Antennas
- The Hertzian dipole
- The half-wave dipole
- Standing waves and velocity of propagation
- Effective antenna length
- The Yagi antenna and the Parabolic dish
- Transmission lines and impedance matching
- Types of transmission lines
- Transmission line characteristic impedance
- Transmission line responses
- Standing wave ratio
- Impedance matching in antenna systems

B. Lab projects

- Optical links simulation exercises using VPIPhotonics or Optisystems (Total: 3 tasks).
- One (1) personal simulation work for each student.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Wide use of ICT and more specifically :
· The course is backed up by a web page providing all course material. This page is duly updated.
· Homeworks are announced electronically through this page, submitted also through this page and marking for them is also announced electronically
· The preferred communication method with the students is email.</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26 hours</td></tr>
<tr><td>Tutorials</td><td>13 hours</td></tr>
<tr><td>Laboratory exercises</td><td>26 hours</td></tr>
<tr><td>Laboratory exercises preparation</td><td>35 hours</td></tr>
<tr><td>Lab report preparation</td><td>15 hours</td></tr>
<tr><td>Study – problem solving</td><td>15 hours</td></tr>
<tr><td>Theory exams</td><td>3 hours</td></tr>
<tr><td>Laboratory exams</td><td>1 hour</td></tr>
<tr><td>Course total</td><td>134 hours</td></tr>
</table>
</td></tr>
<tr><td>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.</td><td>The evaluation is performed in Greek language and is based on two independent parts.

The theory evaluation is performed through a final written test that includes multiple choice questions, short-answer questions and problem solving. Sample solutions to the written test are announced so that a reference point for marking is provided. After the test marks are announced the students have the opportunity to see their mistakes.
The evaluation for the laboratory part is based:
· on the quality of the project reports submtted
· on a final oral exam on the per student lab project implemented</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Fiber-Optic Communication Systems - Govind P. Agrawal
- Practical Antenna Handbook, by Joseph J. Carr

- Related academic journals:

- IEEE J. on Lightwave Technology