COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2606001	**SEMESTER**	6
COURSE TITLE	Communication 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 (ECTS)**
Lectures	4	7
Laboratory	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*	Specialisation Course
PREREQUISITE COURSES:	Stochastic Signals and Systems
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://multicom.teipir.gr/telecommunications.html

(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*

Upon successful completion of this course module students possess advanced knowledge, skills and competences in the subject of Communication Systems that enable them to:

- analyze the basic subsystems of a digital communications system,
- calculate the energy and the power of deterministic signals,
- find the spectrum of a signal,
- estimate the power of a random signal,
- analyze a digital modulation method using its signal constellation,
- design the optimum correlation-type demodulator,
- design the optimum matched-filter-type demodulator,
- choose the appropriate detection criterion,

- calculate the probability of detection error in AWGN channels,
- compare different modulation methods with respect to power consumption and spectrum utilization.

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
- Working independently
- Team work
- Production of free, creative and inductive thinking

(3) COURSE CONTENT

Lectures:

1. Description of a digital communication system
2. Mathematical models for communication channels
3. Energy and power of deterministic signals
4. Fourier transform and the signal spectrum
5. Random signals
6. Sampling and quantization
7. Geometric representation of signals
8. Baseband and bandpass modulation methods
9. Optimum digital demodulation in AWGN channels
10. Probability of detection error in AWGN channels
11. Comparison of digital modulation methods
12. Multiplexing and multiple access
13. Digital transmission on fading multipath channels

Laboratory Experiments:

1. MATLAB overview
2. Periodic signals and the Fourier series
3. Energy signals and the Fourier transform
4. Quantization and PCM systems
5. Autocorrelation function and power spectral density
6. Baseband and bandpass random signals
7. Comparison of digital modulation methods (multiple sessions)

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face lectures</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of electronic presentation with multimedia content in class,
• Student support through the course webpage and the departmental e-learning platform,
• Electronic communication of instructors and students, through the course webpage and by e-mail.
• Use of Matlab / Simulink simulation software in the lab.</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>Lectures, Laboratory experiments, project and study.

<table>
<tr><th>Activity</th><th>Semester workload (hours)</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Study for lectures</td><td>52</td></tr>
<tr><td>Laboratory experiments</td><td>26</td></tr>
<tr><td>Report on lab experiments</td><td>26</td></tr>
<tr><td>Personal or group project related to lecture material</td><td>26</td></tr>
<tr><td>Study and preparation for exams</td><td>28</td></tr>
<tr><td>Course Total</td><td>210</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>Student evaluation is performed in the language of instruction.

Final course grade = Lectures part grade x 60% + Laboratory part grade x 40%

<u>Lectures part grade:</u>
• Midterm Exam (25%)
• Final written exam (75%)
Final written exam includes development questions and problem solving questions. Students are provided with a concise mathematic formulae consultation list.

<u>Laboratory part grade:</u>
• Oral evaluation in the lab, on a weekly basis (10%)
• Midterm project evaluation (45%)
• End of term project evaluation (45%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

<u>Essential reading</u>

1. Proakis J. and M. Salehi, *Communication Systems Engineering*,2nd Edition, Prentice Hall, 2002.
2. Sklar, B., *Digital Communications,* 2nd Edition, Prentice Hall, 2001.

Recommended Books

1. Haykin, S. and M. Moher, *Communication Systems,* 5th Edition, Wiley, 2010.
2. Glover I. and Grant P., *Digital Communications,* 2nd Edition, Prentice Hall, 2004.
3. Rappaport T., *Wireless Communications,* 2nd Edition, Prentice Hall, 2002.