COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2607006	**SEMESTER**	7
COURSE TITLE	Data Compression and Coding		

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	2	4
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:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://multicom.teipir.gr/datacompression.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 Data Compression and Coding that enable them to:

1. calculate the entropy of a source
2. design a Huffman code for the symbols of a given source
3. design a Lempel-Ziv code for a given bit stream
4. estimate the optimum quantizer
5. analyze the multimedia compression standards
6. calculate the capacity of a AWGN channel
7. analyze the linear block codes and implement error correction using syndromes
8. analyze the convolutional codes and implement error correction using the Viterbi algorithm.

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. Modeling of information sources
2. The source coding theorem
3. The Huffman algorithm
4. The Lempel-Ziv algorithm
5. The rate-distortion theory
6. Quantization
7. Prediction techniques
8. Transform techniques
9. Multimedia compression standards
10. Channel capacity
11. Bounds on communications
12. Linear block codes
13. Interleaving
14. Convolutional codes

Laboratory Experiments:

1. MATLAB overview
2. Measure of Information and source entropy
3. The Huffman algorithm
4. Scalar quantization
5. Channel capacity
6. Linear block codes
7. The Hamming code
8. Convolutional codes

(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 signals and systems communication simulation software.</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, projects, study.

<table>
<tr><th>Activity</th><th>Semester workload (hours)</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Study for lectures</td><td>26</td></tr>
<tr><td>Laboratory experiments</td><td>26</td></tr>
<tr><td>Report on lab experiments</td><td>26</td></tr>
<tr><td>Study and preparation for exams</td><td>16</td></tr>
<tr><td>Course Total</td><td>120</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.

<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. Sayood K., *Introduction to Data Compression,* 4th Edition, Morgan Kaufmann, 2012.
3. Wells R., *Applied Coding and Information Theory for Engineers,* Prentice Hall, 1999.
4. Lin and Costello, *Error Control Coding,* 2nd Edition, Prentice Hall, 2004.