ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Α .Δ Ι .Π .
ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ & ΠΙΣΤΟΠΟΙΗΣΗΣ
ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΣΤΗΝ ΑΝΩΤΑΤΗ
ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC
H .Q .A .
HELLENIC QUALITY ASSURANCE
AND ACCREDITATION AGENCY

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ ΚΑΙ ΘΡΑΚΗΣ
ΜΟΝΑΔΑ ΔΙΑΣΦΑΛΙΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΤΕΙ ΑΜΘ

Quality Assurance in Higher Education

Course Data Collection Form

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ
ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ & ΘΡΑΚΗΣ
ΑΓΙΟΣ ΛΟΥΚΑΣ,
65404 ΚΑΒΑΛΑ

EASTERN MACEDONIA AND THRACE
INSTITUTE OF TECHNOLOGY
AGIOS LOUKAS
65404 KAVALA

COURSE OUTLINE

(1) GENERAL

Name and surname of lecturer	Lykourgos Magafas		
SCHOOL	of Technological Applications		
ACADEMIC UNIT	Department of Electrical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	EN4	**SEMESTER**	**5th**
COURSE TITLE	Signal Processing		

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 Exercises	3 Th.	6
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*	*Scientific area,*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek – English in the case of foreign students
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://eclass.teikav.edu.gr/claroline/document/document.php

(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 is an introduction on the subject of signal processing with emphasis on applications that concerns the area of electrical engineer.
The course aims to introduce basic concepts related to signals from the field of mathematics (mathematical representation of signal, basic signals, signals of imaginary numbers, signal characteristics) and their composition (convolution signals, signal transformations).
Also, the course aims at educating students to work on linear processing of signals processing (signal separation, signal classification, noise, thin band spectrum, Filters, linear models construction and prediction) and in nonlinear signal processing (introduction to the theory of chaos, time series of Lorenz, space of phases, autocorrelation function and mutual information function. The invariant correlation dimension parameters, the embedding dimension of immersion, the Lyapunov coefficient and time series prediction are also involved in this aim.)
Further aim of the course is to present applications of signal processing from the field of electronics (converters AD and DA, filters), measurements (sampling and holding circuits), multimedia (audio compression, graphics, image, animation) telecommunication (signal coding, error detection techniques) and telemedicine (communication models).
Upon successful completion of this course the student will be able to:
• understand the basic concepts on the signals and carry out synthesis and transformation of simple signals.
• Be able to perform the linear signal processing (separation and classification of the signal, noise detection, construction linear models and prediction).
• Be able to detect linear and nonlinear signals displayed in the form of time series.
• Be able to perform the non-linear signal processing (calculation of mutual information, the phase space, the strange attractor, embedding dimensions and correlating and predicting future behavior).
• Be able to make application of signal processing on topics related to the electrical engineer

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
Decision-making
Working independently
Team work
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management

(3) SYLLABUS

I. **SignalTypes -Transformations**
a.Signalsof ComplexSignalsBasicprices;
b. FeaturesSizesof Signals
c.Forms ofSignal Processing
d. Discrete-Time Systems
e. ImpulseResponseSystem
f.Convolution
g. FourierTransforms

II. **Linearsignals**
a. SignalSeparation
b. Classification of signals
c. Noise
d. Types of noise- Whitenoise-ColorNoise
e. Spectrum of thinzone
f. Filters
g. Constructionof linearmodelsandprediction
h. The autoregressive model(AR)
i. The autoregressivemoving averagemodel (ARMA)

III. **Non Linear Signals**
a. Introduction to chaos theory
b. Chaotic time series
c. TheLorenz time series
d. The space phases
e. Invariant parameters
f. Autocorrelation function
g. Mutual information function
h. The Theilerwindow
i. The invariant correlation dimension parameters and embedding dimension
j. Lyapunovexponents
k. Kolmogorov entropy
l. Separation method between chaotic signal and color noise
m. Method of first differences
n. Methodofnearestneighborsin order to find theembedding dimension
o. Time series prediction by reproduction the phasesof space

IV. **Applications ofSignal Processing**
A. From thefield ofElectronics andMeasurements.
i)Theinformationas signal–Digitalization
ii)Analog/Digital(A / D)andDigital/Analog(D / A)conversion
iii) Techniques ofConversionfrom Digital signal toAnalogone (D / A)
iv)Techniques ofConversionfromAnalogsignal toDigital one(A / D)
v)InvertersSpecifications
vi)Errorsof Converters
vii)Sampling–Sample and hold circuit
viii)ElectronicFilters

B. From thefieldof Multimedia
i)Soundas information
ii)AudioCompression
iii)Music andComputers
iv)Graphics
v)Image Compression
vi)AnimatedPicture- Video -Compression

vii)MathematicalDescription of aPicture

C. From thefieldofTelecommunications
i)Telecommunicationssignal- Codification
ii)Codification entropy
iii)VariableSizesof Codes
iv)Extensionof Code- TechnicalErrorDetection

D. From thefield ofTelemedicine
i)UtilizedTelecommunicationsInfrastructure
ii)Contact Modelfor DigitalComputer Systems
iii)Applicationsof Telemedicine
iv)FuturetrendsTelemedicine-TechnologicalProblems

E. From thefieldofElectricalCircuits
i)Studyof I-Vcharacteristicfor the case of nonlinearresistance
ii)The use of Chaos Theoryto studynonlinearI-V
iii)Evaluationof non-linearcharacteristicsparameters
iv)Change ininitial conditionsandfinal check

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face (in the classroom)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use slides, websiteof the coursewithsupportingandauxiliarymaterial,
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***
Lectures	39
Laboratory practice	-
	30
Independent study	81
Course total	150

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.*	Theoretical Course Written work (20%), final writtenexamination (80%), that combines theoreticalquestions with critical ones as well as problems covering all the sectionsof the course.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

1. A.Skordas, V. Anastasopoylos, "Digital Processing of Images and Signals". Research team of Multimedia Laboratory, NationalTechical University of Athens, Athens 2000.
2. E.Ventouras "Notes of Telemedicine".
3. T. Lang, "ElectroniquedesSystemsdeMesures" Paris, Milan 1992 .
4. M.Roden, "AnalogandDigital Communication Systems", Prentice Hall, Englewood Cliffs, New Jersey, 1991.
5. A.Oppenheim, A.S.Willsky, and S.H.Nawab, "Signal and Systems" , Prentice Hall Signall Processing Series, 1997.
6. F.Xiong, "Digital Modulation Techniques" Artech House, Boston, London, 2000.
7. J. C. Sprott, "Chaos and Time series Analysis", Oxford University Press, 2003.
8. H.D.I. Abarbanel, "Analysis of observed chaotic data", Springer, New York, 1996.
9. Edited by: J. Astola, and L. Yaroslavsky ,**"Advances in Signal Transforms: Theory and Applications",** Hindawi Publishing Corporation , July 2007