

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	7.020	SEMESTER OF STUDY	7 th
COURSE TITLE	Telecommunication Systems II		
COURSEWORK BREAKDOWN		TEACHING WEEKLY HOURS	ECTS Credits
Theory (Lectures)		3	2
Tutorial/Project		1	1
Laboratory		1	1
TOTAL		5	4
COURSE UNIT TYPE	General Background / Foundation		
PREREQUISITES	Basic knowledge and skills from the courses: Signals and Systems (4 th semester) Telecommunication systems I (6 th semester)		
LANGUAGE OF INSTRUCTION/EXAMS	Greek		
COURSE DELIVERED TO ERASMUS STUDENTS	No		
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE169/		

(2) LEARNING OUTCOMES

Learning Outcomes
The course is a continuation of Telecommunication Systems I and covers a large part of digital telecommunication systems. In particular, the elements of digital communications systems, the factors that influence the design and performance of a digital communications system, the fundamental principles and technological limitations of digital data transmission methods are presented. Noise and interference issues are also covered and basic digital modulation techniques such as ASK, PSK, DPSK, FSK, CPFSK are analyzed. Modulation modes and techniques for coherent and noncoherent demodulation and bearing timing and retrieval cycles are presented. Finally, we introduce the rectangular configurations and the polytone transmission techniques (FDM, OFDM). Upon successful completion of the course the student will be able to: 1. Understand the basic concepts of representation in the time and frequency of digital signals 2. Evaluate and explain the contribution of the parameters that affect the design and performance of a digital communications system 3. Distinguishes and analyzes the differences between different digital communication systems 4. Interprets and evaluates the effect of noise on digital communication systems 5. Knows and explains the basic shapes of digital shaping and demodulation 6. Analyzes bearing timing and retrieval circuits 7. Deepens in the analysis of more complex digital configurations
General Skills
▪ Search, analysis and synthesis of data and information, using the necessary technologies ▪ Adapt to new situations ▪ Decision making ▪ Autonomous work ▪ Working in an international environment ▪ Work in an interdisciplinary environment ▪ Generation of new research ideas

(3) SYLLABUS

Theoretical Lecture Units
• Basic concepts of representation in time and frequency of digital signals. The basic concepts of signal theory are reviewed and the basic mathematical background used in the study of digital communication systems is given (Fourier analysis, probability theory, sampling and coding theory, graph systems). • Basic concepts of representation in time and frequency of digital signals. The basic concepts of signal theory are reviewed and the basic mathematical background used in the study of digital communication systems is given (Fourier analysis, probability theory, sampling and coding theory, graph systems). • Principles of digital communication system design. Digital communications system components, factors influencing the design and performance of digital communications system, fundamental principles and technological limitations in digital data transmission methods. • Basic zone signaling principles. Basic Zone, Binary and M-ary signaling is described. The effect of noise, and finite bandwidth, is analyzed and the maximum channel capacity is described. The problem of interSymbol-Interference and the use of Nyquist and matched filters are presented. • Noise and interference in digital communication systems. • Sources and effects of noise and interference on digital signal transmission parameters. Ways to deal with related problems

- Basic digital shaping techniques. Basic digital modulation techniques (PassBand bandwidth signaling) such as ASK, PSK, DPSK, FSK, CPFSK, are analyzed. Modulation modes and techniques of coherent and noncoherent demodulation are presented. Timing and carrier recovery circuits are presented.

- Rectangular configurations. Vector diagram, constellation diagram, noise effect. Polytone Transmission Techniques (FDM, OFDM).

Laboratory exercises

Simulation exercises using open source software (eg Python, Octave)

1. Fourier transforms and spectral calculation of simple digital configurations (ASK, FSK, PSK etc)
2. Effect of noise on simple digital configurations
3. Rectangular configurations

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in lecturing • Use of ICTs for the communication with students via the e-class platform	
TEACHING ORGANISATION	Method description / Activity	Semester Workload
	Lectures	39
	Laboratory	13
	Bibliography study & analysis	26
	Tutorials	13
	Writing assignments	13
	Non-guided personal study	50
	Total Contact Hours	120
ASSESSMENT METHODS	Language of Assessment: Greek Student Assessment methods: Written examination with problem solving (formative, concluding) Final written examination in the whole material (70%). The exam includes theory questions (from 2 to 4) and practice exercises (from 2 to 4). Laboratory exercises - reports and laboratory test - (30%) The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass.	

(5) RECOMMENDED BIBLIOGRAPHY

- Recommended Bibliography:

- A. Bateman, "Ψηφιακές επικοινωνίες", Εκδόσεις Τζιόλα, 2000, (ISBN: 978-960-8050-03-7).
- Γ. Καραγιαννίδης, Κ. Παππή, «Τηλεπικοινωνιακά Συστήματα», 4η Έκδοση, Εκδόσεις Τζιόλα, 2017 (ISBN: 978-960-418-675-4).
- Taub Herbert, Schilling Donald, "Αρχές τηλεπικοινωνιακών συστημάτων", Εκδόσεις Τζιόλα, 2006 (ISBN: 960-418-061-5).
- Taub Herbert, Schilling Donald, "Τηλεπικοινωνιακά συστήματα", Εκδόσεις Τζιόλα, 2003 (ISBN13: 9789607219329).
- Sam Shanmugam, "Ψηφιακά και αναλογικά συστήματα επικοινωνίας", Μετάφραση – Επιμέλεια: Κ. Καρούμπας, Εκδότης: Πνευματικός, 1999 (960-7258-30-4).

- Relevant Scientific Journals:

- IEEE Communications Surveys and Tutorials
- IEEE Communications Magazine
- IEEE Journal on Selected Areas in Communications
- IEEE Communications Society