UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

DIGITAL COMMUNICATIONS

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-INF/03 (TELECOMMUNICATIONS)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	ELECTRONIC ENGINEERING
Curriculum	Microelectronics
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	50 lesson hours
Language	English
Activity type	ORAL TEST
Teacher	GAMBA PAOLO ETTORE (titolare) - 4 ECTS JORNET MONTANA JOSEP MIQUEL - 2 ECTS
Prerequisites	The course is aimed at students with a basic knowledge of electrical communication and signal theory
Learning outcomes	The student will learn some of the advanced techniques for digital transmission and coding of the information. Accordingly, he/she will be able to design the basic elements of a modern digital communication system, explaining the rational behind his/her choices.
Course contents	The course is for students with a basic knowledge of transmission techniques and is devoted to digital communications. Course introductory notes. Stochastic variables and processes

	Information Theory: entropy. Information Theory: source coding. Channel capacity. Coding techniques for information protection Codes for error detection and correction Algebraic codes Convolutional codes, maximum likelihood decoding, Viterbi algorithm Concatenated codes Turbo codes LDPC codes Transmission on AWGN channels Digital signals: PSD and power Nyquist criterion to avoid intersymbol interference (ISI) Optimum decoder Upper and Lower bounds for BER values Channels with fading Fading definition and effects Diversity techniques Linear equalizers: Zero Forcing Equalizers Linear equalizers: LMS, fractional and Decision Feedback equalizers. Introduction to ML equalizers. Synchronization and syntonization Frequency error estimates (open-loop and closed-loop) Phase error estimates (open-loop and closed-loop) Timing error estimates (open-loop and closed-loop) OFDM modulation (introduction)
Teaching methods	Lectures (hours/year in lecture theatre): 45 Practical classes (hours/year in lecture theatre): 0 Workshops (hours/year in the lab): 0 The concepts are introduced by means of lectures with slides integrated with explanation at the blackboard. Complementary topics are presented by means of one or two seminars by company representatives introducing examples of real digital communication systems.
Reccomended or required readings	J.R. Barry, E.A. Lee, D.G. Messerschmitt. Digital Communication (third edition). Springer 2004
Assessment methods	Oral test, with questions aiming at understanding which are the concepts acquired by the student and his/her ability to explain how the functional blocks of digital systems work. The minimum score to pass the exam is 18, the top one is 30 cum laude.
Further information	Oral test, with questions aiming at understanding which are the concepts acquired by the student and his/her ability to explain how the functional blocks of digital systems work. The minimum score to pass

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Sustainable development goals - Agenda 2030	GOAL 9: INDUSTRIES, INNOVATION AND INFRASTRUCTURE $lbl_legenda_sviluppo_sostenibile