UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

WIRED AND WIRELESS COMMUNICATION SYSTEMS	
Anno immatricolazione	2020/2021
Anno offerta	2021/2022
Normativa	DM270
SSD	ING-INF/03 (TELECOMUNICAZIONI)
Dipartimento	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
Corso di studio	INDUSTRIAL AUTOMATION ENGINEERING - INGEGNERIA DELL'AUTOMAZIONE INDUSTRIALE
Curriculum	Robotics and Mechatronics
Anno di corso	2°
Periodo didattico	Primo Semestre (27/09/2021 - 21/01/2022)
Crediti	6
Ore	45 ore di attività frontale
Lingua insegnamento	English
Tipo esame	ORALE
Docente	FAVALLI LORENZO (titolare) - 6 CFU
Prerequisiti	None specific
Obiettivi formativi	Give students the knowledge to understand problems and technical solutions to operate a communication system. Impact of the environment and of the service type on the preferable solution. Description of the main commercial systems with reference to the studied techniques. It is assumed that students don't have any background in telecommunications, and will be more interested in their exploitation in industrial environments. As a consequence, the theoretical aspects will be limited and focus will be on application examples. At the end of the course, it is expected that the student will know: - The physical principles that affect a transmission system - The transmission techniques and their effectiveness in presence of

above mentioned phenomena
- Effects of the interaction between different users and services
- The reasons behind the choices of different techniques in different systems
- The performance that can be achieved and the factors influencing them
All this with the final aim to give students the tools to analyze requirements and consequently adopt a conscious choice based on the requested service.

Programma e contenuti	Characterization of signals: - Characterization in time - Characterization in frequency - Statistical properties Characterization of transmission impairments. Propagation phenomena and how to design efficient transmission techniques. Transmission over radio channels. Attenuation, multipath, fading, doppler effect, crosstalk. Review of transmission techniques (analog and digital) analog to digital conversion, transmission of baseband digital data: robustness to noise and bandidth efficiency. Introduction to traffic theory for performance characterization and system planning. Kendall's notation, Little's result, transition matrix and state probabilities for Markov systems, birth death processes, examples. Circuit switched networks: space, time and hybrid circuit switched nodes. Minimization of crosspoints. Blocking probability. Signaling, in-band, out-of band, common channel. Multiplexing in circuit switched networks frequency (FDM), time (TDM) and code (CDM). Duplexing. Packet switched networks. The ISO/OSI reference model, protocols and interfaces. Line management, link configuration, packet extraction, error control (FEC and ARQ). Sample protocols: HDLC, PPP. Distributed multiplexing in packet networks: Aloha, Slotted-Aloha, CSMA/*, Token passing. Local packet based systems. Wired and Wireless Local Arean Networks (LAN) in the IEEE 802 set of standards. Short range and sensor networks. Networks and applications in industrial environments Wide area packet networks. Historical perspective, Frame relay and ATM networks. Quality of service concepts. Internet architecture and protocols (IP, TCP, UDP). Evolution and convergence to IP based networks.
Metodi didattici	Class talks given with the support of slides and integrated with the use of blackboard for specific topics.
Testi di riferimento	Slides, Links, selected papers and book chapters. Useful texts: -William Stallings, DATA AND COMPUTER

COMMUNICATIONS
Eighth Edition, Pearson Prentice Hall
- J. Kurose, K. Ross, "Computer Networking: A Top-Down Approach."
Pearson

Modalità verifica apprendimento	Oral exam. The students are offered the opportunity to select a topic to study in depth and provide a presentation.
Altre informazioni	
Obiettivi Agenda 2030 per lo sviluppo sostenibile	$lbl_legenda_sviluppo_sostenibile