

Course unit title:	Wireless & Mobile Computing
Course unit code:	CSC621
Type of course unit: (Compulsory/optional)	Elective
Level of course unit: (First, second or third cycle)	Master (2 nd cycle)
Year of study:	1
Semester when the unit is delivered:	2
Number of ECTS credits allocated:	8
Name of lecturer(s):	TBA
Learning outcomes of the course unit:	
<p>Upon successful completion of this course students should be able to:</p> <ul style="list-style-type: none"> • Describe multiple access techniques such as FDMA, TDMA, CDMA, SDMA and demonstrate their design and application. • Examine system capacity and examine optimisation techniques to improve capacity such as power control, diversity, adaptive modulation and channel allocation and channel selection techniques. • Grade system performance based on BER, blocking and dropping probability, trunking efficiency and apply them to assess system performance for a TDMA and CDMA system. • Compare multiple access techniques and quantify parameters and throughput. • Appreciate the advantages and disadvantages of common flow and error control techniques. • Discuss and compare the design decisions behind various types of 2G to 4G wireless networks such as GSM, WCDMA, Wi-Fi, WiMAX and Bluetooth standards. • Describe how cognitive radios systems are set to shape the future generation of wireless networks. 	
Mode of delivery:	Face-to-Face

Prerequisites and co-requisites:	CSC603
Recommended optional program components:	None

Course contents:

Objective:

To provide an overview of the broad and constantly emerging field of Wireless Mobile Communication Networks. Basic principles of Personal Mobile communications are discussed as the necessary tool for understanding computer communication networks. Mobile propagation models are examined as they account for the design features in current second and third generation standards which allow operation over fast fading channels. To describe the most popular Wireless Network standards while introducing methods of optimising the capacity and operation of these networks. To introduce other systems used for personal communication systems, and outline fourth generation standards that are currently under development.

Description:

History of personal and mobile communications

Introduction to wireless communications will describe the history of cellular communications, and the development of first, second and third generation standards. Furthermore, it will give an overview of key wireless technologies: voice, data, cordless, paging, fixed and mobile broadband wireless systems, and beyond.

Radio wave propagation models

Wireless communication links encounter losses due to the propagation environment that can be described based on the different terrain, path, obstructions, atmospheric conditions and other phenomena. Various propagation models exist to estimate the path loss of the signal for different propagation environments. It is important in this part of the course to understand the concept of path loss, small-scale fading, multipath, reflection, diffraction, scattering, shadowing, spatial-temporal channel modelling, and microcell/indoor propagation.

We will then describe a number of mobile propagation models used in various wireless technologies (GSM, BFWA, Wi-Fi, WiMAX, Bluetooth etc) and look at the design features of these technologies that are employing to cope with the various propagation environments.

Cellular techniques

Interference (co-channel and adjacent channel) has a great impact on the performance of any cellular wireless network. In this part of the course a number of methods for optimising the capacity and operation of the most popular 2G to 4G networks will be presented. These methods include power control, diversity, equalisation, adaptive modulation and channel allocation and channel selection techniques (Radio Resource Management techniques).

Furthermore, we will emphasise on the frequency planning and frequency re-use techniques that are employed by current cellular systems.

Multiple Access Techniques

Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA) and Spatial Division Multiple Access (SDMA) techniques to optimise the spectral efficiency.

Old and New Cellular Wireless Technologies

GSM and WCDMA Overview of the new 3G air interface standards (WCDMA, cdma2000, GPRS, UMTS and EDGE).

New Wireless LAN Technologies

Overview of the IEEE 802.11a/b/g/n, HIPERLAN, BRAN and 802.16 (WiMAX)
Also, overview of ad-hoc and sensor networks.

Wireless Network Protocols

This includes Wireless TCP, Session Mobility, Mobile IP and review of the transport protocols for mobile networks. Wireless/mobile networks routing (AODV, DSR, TORA etc).

Software Defined Radios and Cognitive Radios

Software defined radio (SDR) is a reconfigurable radio communication system that can receive and transmit new form of radio protocol just by running new software. Based on the SDR, cognitive systems can become the new standard for wireless communications to improve spectrum utilization. In this part of the course, the concept of SDR and Cognitive radios will be presented as well as the concept of licensed and unlicensed bands.

Recommended or required reading:

Rappaport, TS., 'WIRELESS COMMUNICATIONS: PRINCIPLES AND PRACTICE', Prentice Hall

Saunders, SR., 'ANTENNAS AND PROPAGATION FOR WIRELESS COMMUNICATION SYSTEMS', Wiley

Prasad, R, Mohr, W., 'THIRD GENERATION MOBILE & Konhauser W., COMMUNICATIONS SYSTEMS', Artech House

Holma, H, & Toskala, A., 'WCDMA FOR UMTS: RADIO ACCESS FOR THIRD GENERATION MOBILE COMMUNICATION', Wiley

Steele, R, & Hanzo, L., 'MOBILE RADIO COMMUNICATIONS: SECOND AND THIRD GENERATION CELLULAR AND WATM SYSTEMS', Wiley

Planned learning activities and teaching methods:	Class Instruction: Consultation:	<table border="1"> <tr> <td data-bbox="1031 226 1261 285">42 hours</td> </tr> <tr> <td data-bbox="1031 285 1261 344">15 Hours</td> </tr> </table>	42 hours	15 Hours	
42 hours					
15 Hours					
Assessment methods and criteria:	Examinations Project/Assignments	<table border="1"> <tr> <td data-bbox="1031 422 1261 464">70%</td> </tr> <tr> <td data-bbox="1031 464 1261 506">30%</td> </tr> <tr> <td data-bbox="1031 506 1261 541">100%</td> </tr> </table>	70%	30%	100%
70%					
30%					
100%					
Language of instruction:	English				
Work placement(s):	No				
Place of Teaching:	Regular Classroom European University Cyprus, Nicosia Computer Science Laboratory European University Cyprus, Nicosia				