

Subject code	Credits
INFN4011	4

Course title in Lithuanian

MOBILIOJO IR BELAIDŽIO RYŠIO TECHNOLOGIJOS

Course title in English

MOBILE AND WIRELESS COMMUNICATIONS

Short course annotation in Lithuanian (up to 500 characters)

Šis studijų dalykas skirtas suteikti bendrąjį supratimą apie šiuolaikines informacines ir ryšių technologijas. Turinys apima: signalų perdavimą; komutaciją; skaitmeninimą; kodavimą; moduliaciją; multipleksavimą ir plačiajuostes technologijas; signalizaciją ir intelektualius tinklus; prieigos tinklus; belaidį ryšį; 2G/3G/4G tinklų struktūras ir paslaugas; mobiliųjų tinklų evoliuciją ir telekomunikacijų bei kompiuterinių tinklų technologijų konvergenciją. Pabaigę šį dalyką, studentai turi suprasti mobiliųjų ir belaidžių tinklų veikimą bei paslaugų šiuolaikiniams tinklams kūrimo principus. Dalykas dėstomas paskaitose, laboratoriniuose darbuose kompiuterių klasėje, taip pat studentai gauna užduotis savarankiškam darbui.

Short course annotation in English (up to 500 characters)

This course aims to develop basic understanding in modern communication technologies. The content includes: signal transmission, switching, digitization, coding and modulation; channel multiplexing; broadband technologies; signalling and intelligent networks; access networks, wireless communications; 2G/3G/4G network structure and services; mobile networks evolution and convergence of telecommunications and networking technologies. On completion of this subject students should understand mobile and wireless networking and service design principles for modern networks. The course structure consists of lectures, laboratory works in computer classroom, as well as individual work.

Prerequisites for entering the course

INF3001 Computer Networks

Course aim

Provide knowledge on main operational and design principles of modern communication systems, standards of mobile and wireless networks and their evolution.

Content

No	Content (topics)
1.	Communication system structure and signals (6 hours). Signal representation. Signal models. Signal spectrum. Analog-to-digital conversion. Signal modulation techniques. Signal multiplexing.
2.	Principles of telephony (3 hours). Signal transmission. Speech signal coding. PCM (Pulse code modulation). Signal switching. Principles of circuit- and packet switching. Signalling. Intelligent networks. Billing. Network management.
3.	Broadband technologies (3 hours). Digital signal standards. E- and T- families. Synchronous Digital Hierarchy. Asynchronous Transfer Mode. Spread spectrum technologies.
4.	Access network technologies and transmission media (6 hours). Analog and digital access networks. DSL (Digital Subscriber Line) technologies: ISDN, xDSL. Wired- and wireless transmission media: copper wires, twisted pair, coaxial cables, optical fibre, radio access, radio-relay lines, satellite communications.
5.	Radio spectrum allocation and regulation (3 hours). Radio spectrum. Radio spectrum administration. Regulation of telecommunication operators. Applications of different radio spectrum ranges.
6.	Radio signal propagation features. Antennas (3 hours). Radio signal transmitters and receivers. Propagation effects: refraction, diffraction, fading, scattering, multipath propagation, interference. Signal distortion, noise. Signal power and signal-to-noise ratio measurement units. Isotropic and dipole antennas. Antenna gain. Directional and sectorized antennas. Receive diversity and smart antenna principles.
7.	Mobile and wireless communication principles. (6 hours). Differences between mobile and wireless. Mobile and wireless network features. Model of mobile communication system. Multiple access techniques. Space-, frequency-, time- and code division multiple access, multicarrier techniques and OFDM (Orthogonal frequency division multiplexing).
8.	Types of mobile communications (3 hours). Cordless telephony. Paging. Private mobile and trunked radio. Cellular communications. Satellite communications.
9.	2G/3G/4G cellular communication systems (6 hours). History and generations of cellular systems. GSM network architecture and operation principles. GSM radio interface. GSM evolution, GPRS and EDGE. 3G network standards. UMTS network architecture. UMTS releases. UMTS radio interface. Evolution of WCDMA (Wideband code division multiple access) technology. HSDPA, HSUPA, HSPA+, pre-4G/LTE and 4G standards. Mobile network management. OSS (Operational support systems). TMN (Telecommunications management network) model.
10.	Wireless LAN technologies (3 hours). WLAN (Wi-Fi) standards. Wireless network topologies and operation modes. WiMAX standards and networks.
11.	Future of mobile and wireless (3 hours). Beyond 4G. Convergence of networking and telecommunication technologies.

Distribution of workload for students (contact and independent work hours)

Lectures	45 hours
Laboratory work	15 hours
Individual students work	50 hours
Total:	110 hours

Structure of cumulative score and value of its constituent parts

Final assessment comprises the assessments of written final examination (50%), written mid-term examination (25%) and assessment of laboratory works and home works (25%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	Self-study rooms	Other libraries
<i>Basic materials</i>						
1.	2007, updated 2015	White, C.M. <i>Data Communications and Computer Networks, 8th Ed.</i>	Thomson Course Technology	1	-	5
2.	2006	Kajačkas, A. <i>Telekomunikacijų teorija (Theory of Telecommunications)</i>	Technika	5	1	available online at www.ebooks.vgtu.lt/cpdownloadpdf/telekomunikacij-teorija
3.	2003	Shiller, J. <i>Mobile Communications</i>	Addison-Wesley	1	-	2
4.	2009, updated 2015	<i>Network Applications, Technology and Implications</i>	Larry Press, California State U.	-	-	available online at www.globaltext.org
...						
<i>Supplementary materials</i>						
1.	2007, updated 2015	<i>Wireless Networking in the Developing World</i>		available online at www.globaltext.org		
2.	2002, updated 2010	<i>Principles of Digital Communication and Coding</i>		available online at www.globaltext.org		
3.	2000	Bellamy, J.C. <i>Digital Telephony</i>	John Wiley & Sons			

Course programme designed by

Assoc. Prof. Dr. Kęstutis Šidlauskas, Department of Applied Informatics