| Detailed Course Description - Course Plan Development and Updating Procedures/ Computer Science Department | QF01/0408-3.0E |
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| Faculty | Faculty of Science &Information Technology | Department | Computer Science |
| **Course number** | 122245 | Course title | Wireless Computer Networks |
| Number of credit hours | 3 | Pre-requisite/co-requisite | Networks Protocols |

This course gives an overviews and a description of wireless computer networks. It describe the basic concepts and principles of wireless communications. Provides essentials of wireless communications and wireless networking, including the different types of wireless computer networks such as(Wireless Personal Area Networks (WPAN), Wireless Local Area Networks (WLAN), and Wireless Wide Area Networks (WWAN), and internetworking between WLAN and WWAN). also, the course gives the needed knowledge about other types of wireless communication that are became an integral part of computer network as cellular networks, and sensors networks. The course combines the theoretical knowledge of wireless networking with the practice part, where the student implementing their knowledge to build and implement the wireless techniques in a real tasks and examples.

| | **Course goals and learning outcomes** |
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| **Goal 1** | Understanding The basic concepts of wireless communication and providing the knowledge about the different types of wireless networks systems. |
| Learning outcomes | 1.1. Cite the needs for wireless communication systems and their usage applications.<br>1.2. Identify and describe the technologies that are used in each wireless system type and there characteristics.<br>1.3. be able to identify the principles of constructing different wireless systems according to needs and environments. |
| **Goal 2** | Understanding the data transmission over signals using various types of modulation, multiplexing and coding techniques in wireless systems. |
| Learning outcomes | 2.1. Provide basic understanding of modulation techniques as FM, AM and PM for carrying data over signals.<br>2.2. Examine of multiplexing techniques that are using for carrying data using FHSS and DSSS.<br>2.3. Provide understanding the problems of interferences in wireless communication and the methods for solving such problems. |
| **Goal 3** | Presenting and overview the methods of constructing the different types of wireless networks, topologies, work principles, characteristics and configuration. |
| Learning outcomes | 3.1.Be able to develop the requirements for building wireless network and their topologies. |

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| | 3.2. Ability to analyze, design and create WLAN and it configuration.<br>3.3. Provide the basic understanding for developing The WPAN as Bluetooth, wireless sensors networks and ZigBee. |
| **Goal 4** | Presenting and Overview the basic principles of building the Cellular Networks. |
| Learning outcomes | 4.1. Understanding the basic principles of building GSM networks, their architecture and how they are working.<br>4.2. Understanding the main characteristics of each generation of cellular networks, their implementation and services.<br>4.3. Provide the basic understanding of connecting and roaming methods in cellular networks. |
| **Textbook** | 1.-CCNA Wireless 200-355 official Cert Guide, David Hacaby. 2016<br>2.- Wireless Networking: Understanding Internetworking Challenges. Jack L. Burbank. Julia Andrusenko. 1st edition 2013. |
| **Supplementary references** | 1.- Wireless Communications & Networking, Vijay K. Garg. 2008<br>2.- Guide to Wireless Communications 4th Edition. Jorge Olenewa. 2016<br>3.- Wireless Networks 3rd Edition, Clint Smith, Daniel Collins. 2014. |

| Course timeline | | | | |
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| **Week** | **Number of hours** | **Course topics** | **Pages (textbook)** | **Notes** |
| **01** | **1**<br>**1**<br>**1** | **Introduction to wireless communications and their theory**.<br>-types of wireless data application<br>-types of wireless networks | | |
| **02** | **1**<br>**1**<br>**1** | **RF signals and modulation**<br>-comparing wired and wireless networks<br>-understanding the basic wireless theory.(Frequency, Amplitude, Phase, wavelength)<br>-Multiplexing and DE multiplexing. | | |
| **03** | **1**<br>**1**<br>**1** | Carrying data over RF signals. FHSS,DSSS<br>IEEE Standards body, 802.11 channel use, | | |
| **04** | **1**<br>**1** | **Wireless LAN topologies**: Basic service set (BSS, distribution system (DS), Extended Service | | |

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| | 1 | Set(ESS), Independent Basic service set (IBSS). Outdoor bridge, mesh network, other wireless topologies. | | |
| 05 | 1<br>1<br>1 | WLAN equipment, WLAN topologies, WLAN technologies ( Infrared technology, UHF narrowband technology, and Spread spectrum technology) IEEE 802.11 WLAN (IEEE 802.11 architecture ). | | |
| 06 | 1<br>1<br>1 | **Practice:** Creating new wireless LAN<br>-Configuring the wireless LAN<br>-Configuring wireless LAN security.<br>-Configuring Wireless LAN QoS | | |
| 07 | 1<br>1<br>1 | 802.11 physical layer (PHY).<br>Roaming overview<br>Roaming between autonomous APs, Active roaming, | | |
| 08 | 1<br>1<br>1 | Passive roaming<br>- IEEE802.16, and World interoperability for microaccess, inc.(WiMAX) ( WiMAX physical layer (PHY), WiMAX media access control (MAC), and Spectrum allocation for WiMAX) | | |
| 09 | 1<br>1<br>1 | **Wireless personal area network:**<br>**Bluetooth:** Introduction, the Wireless personal area network, Bluetooth (IEEE 802.15.1), and Definitions of the terms used in Bluetooth. Bluetooth protocol stack and Bluetooth link types. | | |
| 10 | 1<br>1<br>1 | Network topology in Bluetooth, Bluetooth usage models, Bluetooth Application<br>- Bluetooth security (Security levels, and Limitations of Bluetooth security), Network connections establishment. | | |
| 11 | 1<br>1<br>1 | **Practice:** Creating a Bluetooth network, establishing, configuring, securing. | | |
| 12 | 1<br>1<br>1 | **Wireless personal area network: low rate and high rate:** Introduction, **Wireless sensor network**, - Usage of Wireless sensor network, and Wireless sensor network model.<br>-Sensor network protocol stack | | |
| 13 | 1<br>1<br>1 | **Continue Wireless personal area network: low rate and high rate : ZigBee technology** ( ZigBee components and network topologies ), IEEE 802.15.4 LR-WPAN device architecture (Physical layer, and Data link layer) | | |

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| **14** | **1<br>1<br>1** | **Cellular network systems**<br>Introduction, First- and second-generation cellular systems, Cellular communications from 1G to 3G, and Road map for higher data rate capability in 3G. | | |
| **15** | **1<br>1<br>1** | **Continue overview of wireless systems :** Wireless 4G systems, Future wireless networks, and Standardization activities for cellular systems | | |
| **16** | **1<br>1<br>1** | **Discussion the final projects** | | |

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| **Theoretical course evaluation methods and weight** | Participation = 10%<br>First exam 20%<br>Second exam 20%<br>Final exam 50% | **Practical (clinical) course evaluation methods** | Semester students' work = 50%<br>(Reports, research, quizzes, etc.)<br>Final exam = 50% |

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| **Approved by head of department** | | **Date of approval** | |

Extra information (to be updated every semester by corresponding faculty member)

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| **Name of teacher** | Mohammad Al Rawajbeh | Office Number | **317** |
| Phone number (extension) | 419 | Email | m.rawajbeh@zuj.edu.jo |
| Office hours | | | |