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|  | **Hashemite University**  **College of Engineering**  **Department of Computer Engineering**  **Wireless Networks**  **(3 Credit Hours/Dept. Compulsory )** | | | | | | | | | |  |
| **Instructor** | | | |  | **Grading info** | | |  | **Class Info** | | |
| Dr. Eslam Malkawi | |  | |  | Mid Exam | | 25% |  | Days | Sec: Mon/Wed | |
| Email: | | eslam.malkawi@hu.edu.jo | |  | Lab Work | | 20% |  | Time | Sec: 11:00 AM-12:00 PM | |
|  | Presentations | | 9% |  |
|  | Report | | 6% |  |
| Office: | | E-3060 | |  | Final Exam | | 40% |  | Location | Online-MT | |
| Office hours: | | During lecture time  Anytime in Microsoft Teams | |  |  | |  |  |  |  | |
| **Course** | | | | | | | | | | | |
| Course Number: | | 110408457 | | | | | | | | | |
| Prerequisite: | | Computer Networks (110408450) | | | | | | | | | |
| Textbook: | | **"Wireless Communications and Networks",** William Stallings, Prentice- Hall, 2nd Edition. | | | | | | | | | |
| Course Description: | | The objective of this course is to give an introduction to the fundamentals of the wireless communication systems, the wireless network architectures, protocols, and applications. The course surveys various wireless networking technologies and mechanisms with an emphasis on protocol design for efficient systems. Technologies covered range from personal area networks like Bluetooth to cellular wide area networks. In details, the covered topics are overview of communication networks and protocols, antennas and propagation models, coding and error control, multiple access techniques, and wireless networking standards (e.g., 2.5G, 3G, IEEE 802.11,IEEE 802.15, IEEE 802.16/WiMAX). | | | | | | | | | |
| Specific Outcomes of Instruction (Course Learning Outcomes) | | 1. **Examine** the fundamentals and basic concepts or signals and transmission. (a) 2. **Review** the different types of communication networks, switching techniques and protocols. (a) 3. **Understand** the common wireless network architectures, antenna characteristics and types, propagation modes, wireless channel models, and multiple-access schemes.(a,e) 4. **Apply** the fundamental concepts of communications and signal processing to wireless network design. (a) 5. **Analyze** the techniques for error detection and correction, cellular network capacity, and path losses.(e) 6. **Design** and simulate different wireless network topologies using NS2, and evaluate their performances. (a, g, k) 7. **Measure** the wireless signal characteristics using hardware device (wifi tester) and analyze them. (k) 8. **Conduct** and present case study of latest wireless networks. (g, i, j) | | | | | | | | | |
| Important material | | * Lecture notes * Text book and references * Internet resources | | | | | | | | | |
| **References:** | | | | | | | | | | | |
| * **“Ad hoc Wireless Networks: Architecture and Protocols” C. Siva Ram Murthy and B. S. Manoj. Prentice Hall, 2004.** * **“Wireless Communications: Principles and Practice” Theodore S. Rappaport. Prentice Hall, 2002.** * **http://www.isi.edu/nsnam/ns/tutorial/. Tutorial for NS2 in simulating wireless networks.** | | | | | | | | | | | |
| **Major Topics Covered and Schedule in Weeks:** | | | | | | | | | | | |
| **Topic** | | | **# Weeks** | | | **# Contact hours\*** | | | | | |
| Overview & Introduction: Introduction and overview of data communications and wireless networks. | | | 0.5 | | | 1 | | | | | |
| Transmission Fundamentals: Basic overview of transmission topics and concepts. | | | 2 | | | 4 | | | | | |
| Communication Networks: Comparison of basic communication network technologies | | | 2 | | | 4 | | | | | |
| Protocols and the TCP/IP Protocol Suite: Overview of TCP/IP protocol architecture and OSI model | | | 1 | | | 2 | | | | | |
| Antennas and Propagation: Antenna types, propagation modes and channel models | | | 2 | | | 4 | | | | | |
| Coding and error control: Error detection, error correction and automatic repeat request. | | | 1.5 | | | 3 | | | | | |
| Wireless Networking:   * Satellite Communications * Cellular Wireless Networks * Wireless LAN technologies * WiFi and IEEE 802.11 * Bluetooth and IEEE 802.15 * Wireless Sensor Networks | | | 1  1  1  1  0.5  0.5 | | | 2  2  2  2  1  1 | | | | | |
| Internal Lab:   * Introduction to NS2 and NAM software. * TCL scripts. * Simulating wired networks in NS2. * Simulating wireless Networks in NS2. * Implementing a multi-hop wireless network using arduino with WiFi shield. * Using WiFi tester to collect data and troubleshoot wireless networks. | | | 1  1  2  1  1  1 | | | 2  2  4  2  2  2 | | | | | |
| Total | | | **14** | | | **28 + 14 lab work** | | | | | |
| **Course Policy** | | | | | | | | | | | |
| * The course will follow selected subjects as listed on the course schedule. Additional lecture notes and examples will be given and discussed in class as much as time permits. * Students are responsible for the reading assignments from the text and handouts * Students are responsible for following up the lecture materials * Students are responsible for reading additional information and examples in order to understand the materials discussed in the lectures. * If you miss class, there won’t be a makeup test, quiz, etc. and you will get a zero unless you have a valid excuse. * Cheating and plagiarism are completely prohibited. * If you miss more than 15% of classes you will automatically fail the class. | | | | | | | | | | | |

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| **Student Outcomes (SO) Addressed by the Course:** | | |
| ***#*** | ***Outcome Description*** | ***Contribution*** |
| ***General Engineering Student Outcomes*** | | |
| (a) | An ability to apply knowledge of mathematics, science, and engineering | ***H*** |
| (b) | An ability to design and conduct experiments, as well as to analyze and interpret data |  |
| (c) | An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |  |
| (d) | An ability to function on multidisciplinary teams |  |
| (e) | An ability to identify, formulate, and solve engineering problems | ***H*** |
| (f) | An understanding of professional and ethical responsibility |  |
| (g) | An ability to communicate effectively | ***M*** |
| (h) | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |  |
| (i) | a recognition of the need for, and an ability to engage in life-long learning | ***L*** |
| (j) | A knowledge of contemporary issues | ***L*** |
| (k) | An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | ***M*** |
| **H**=High, **M**= Medium, **L**=Low | | |

**Prepared By: Dr. Eslam Malkawi**