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**Department of Computer Science and Information Technology**

**College of Science**

**University of Salahaddin**

**Subject: Wireless and Mobile Computing**

**Course Book – (4th IT Year)**

**Lecturer's name Arazu Saeed Omer**

**Academic Year: 2021/2022**

**Course Book**

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| **1. Course name** | Wireless and Mobile Computing |
| **2. Lecturer in charge** | Arazu Saeed Omer |
| **3. Department/ College** | Computer Science and Information Technology / Science |
| **4. Contact** | e-mail: arazu.omer@su.edu.krdTel: (0750 4965295 ) |
| **5. Time (in hours) per week**  | Theory: 2Practical: 0  |
| **6. Office hours** |  Tuesday : 10:30 am -12:30 pm  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **Teaching:** **-Acquired a BSc from college of Education –Computer Science Department in Salahaddin University in 2003****-Graduated with MSc in** “Availability and reliability of MoH in erbil **“from University of Salahaddin in 2011****-I have been working in the Department of computer science as assistant programmer since January 2004** * Attended networking labs as a teaching assistant in Salahaddin University, College of Education-Computer Science Dept
* Attended Compiler labs as a teaching assistant in Salahaddin University, College of Education-Computer Science Dept
* Attended assembly labs as a teaching assistant
* Attended Image Processing labs as a teaching assistant
* Attended numerical lab as a teaching assistant
* **Teaching the following model in Salahaddin University, College of Scinence-Computer Science Dept**
* Teaching Academic debate 2015-2016
* Teaching computer system lab 2015-16
* teaching compiler in 2015-2016 as a teaching assistant
* Logic system in 2016 -2017
* Logic system in 2017- 2018
* Wireless and Mobile computing 2018-2019
* Lab network 2018-2019

-Wireless & Mobile computing 2019-2020**Supervision**:I am currently supervising final year projects which are: -  |
| **9. Keywords** |  |
| 10. Course overview:  How can we cope with users and computers that move from place to place, and yet wish to remain in contact with the net? This module looks at a range of wireless communications technologies, and addresses some of the problems of mobile ad-hoc and wireless networks. It exposes students to some of the most important developments in computer networking. This module approaches wireless and mobile networking from several areas. This includes* A network layer solution that enables continuous higher layer connection when a node is mobile in the Internet,
* Multiple access control protocols to share the wireless transmission media – the air, Wireless technologies including Bluetooth and Wireless LAN,
* Highly established telecommunication networks and the development of different generations of cellular networks, and
* Issues and solutions in wireless ad hoc networks – networks that have no fixed topology or central administrators
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| **11. Course objective** * Appreciate some of the important developments in computer networking
* Understand how can we cope with users and computers that move from place to Place, and yet wish to remain in contact with the net
* Recognize some of the problems that must be solved if multiple users want to

send data over a shared transmission media. |
| **12. Student's obligation** 1- Attendance.1. Quiz
2. Homework
3. There examinations will be given, each 40%.
4. Final exam 60%.

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| **13. Forms of teaching**1- data show 2- whiteboard  |
| **14. Assessment scheme**  1- Attendance 2%1. Quiz :8%
2. There examinations will be given, each 30%.
3. Final exam 60%.
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| **15. Student learning outcome** * To have a knowledge and understanding of the problems and issues arising when mobility occurs in networks.
* To be able to discuss and evaluate protocols intended to solve problems or address new applications that arise in mobile networking
* To be able to explain the issues involved in their work and justify and explain the approach taken
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| **16. Course Reading List and References‌:*** Ad Hoc Wireless Networks: Architectures and Protocols, 1st edition

Authors: C. Siva Ram Murthy, and B.S. Manoj Publisher: Prentice Hall Published: May 2004 ISBN: 013147023X* Wireless Communications & Networks, 2nd edition Author: William Stallings Publisher: Prentice Hall Published: December 2004 ISBN-10: 0131918354
* Computer Networks, a system approach, Larry L. Peterson and Bruce S. Davie, 3rd edition
* Computer Networking, a Top-down approach, James F. Kurose and Keith W. Ross, 3rd edition
* V. Bharghavan, A. Demers, S. Shenker, L. Zhang, “MACAW: A Media Access Protocol for Wireless LANs”, Proc. Of ACM SIGCOMM 1994, pp. 212-225, August 1994
* J. Broch, D.A.Maltz, B.D.Johnson, Y.Hu and J.Jetcheva. A Performance comparison of multi-hop wireless ad hoc routing protocols. In mobicom’98: Proceedings of the 4th annual ACM/IEEE International conference on Mobile Computing and Networking, pages 85-97, 1998.
* Wireless Communications & Networks . William Stallings, 2nd edition.
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| **17. The Topics Lecturer's name** |
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| No. | Lecture |
| 1 | **Introduction** : history, physical and Technological constrains, on computer science.  |
| 2 | **Wireless network** advantages and disadvantages |
| 3 |  **Wireless network** : Packet Radio Network, Wireless LAN/ WAN , Wireless LAN topologies  |
| 4 | **Wireless Communication**: Radio propagation, Media access, Wireless communication system, Types of Wireless communication, (fixed , portable, mobile )  |
| 5 -6 | **Wireless protocol** : wireless TCP , session mobile |
| 7 | **Basic of wireless standard**: Bluetooth (link software manager), Infrared (night vision, thermal image, IrDA), Wi-Fi, Li-Fi |
| 8 | **Wi-fi standard** ,802.11 (a, b, g, n, ac) |
| 9-10 | **Antenna types**: Omnidirectional(Rubber Duck, Spider, ceiling), Directional antenna (patch , sector, parabolic and grid antenna) |
| 11-13 | **Mobile networking** : Mobile IP(1) , Ad hoc network and Ad hoc routing |
| 14 | Mobile IP(2) |
| 15 | **First exam** |
| 16-17 | Locating ,Routing protocol ,Mobility and handoff . |
| 18 | Security and mobile authentication |
| 19 | **Mobile application** : Mobile agent ,Wireless web and WAP |
|  20-21 | **Introduction to GSM Architecture**(Mobile station, base station subsystem, network switching subsystem , operation support subsystem) |
| 22 | **Human-computer interaction** :wearable computing |
| 23-25 |  TDMA , FDMA , CDMA technology |
| 26-28 | **VOIP, LTE, 3G, 4G, 5G** technology feature and architectures |
| 29 |  power management and Energy AwernessComputing |
| 30 |  **Second exam** |

**The Questions:****Q1//A) Why Maintaining Ongoing Connection?**  **B) What causes the jitter?**  **C) How is tunneling used in mobile IP?** **Q3// Choose clearly ONE answers for each question** 1. **Routers in the Internet know and care only how to route packets based on. (Choose the best answer)**
2. The IP address and Subnet number of the source
3. The IP address and Subnet number of the destination
4. The Subnet number of the destination address in each packet
5. The Subnet number of the source address in each packet
6. All of them
7. **The mobile IP protocol is aimed at. (Choose the best answer)**
8. Moving the IP protocol around
9. Providing continuous connections to mobile users in the IP networks
10. Defining a different version of IP protocols that can roam
11. Providing users with mobile addresses rather than fixed addresses.
12. Breaking an established TCP/IP connection into a mobile connection
13. **A care-of-address will be assigned to a mobile node**
14. when the mobile node moves from its home network to a foreign network
15. when the mobile node installs a new network interface card
16. when the mobile node moves within its home network
17. when the mobile node reboots within its home network
18. when the mobile node moves back to its home network
19. A host with home address **128.18.5.1** moves to a new network where it gets a care of address **129.18.5.1**

 by using mobile IP. Which of the following is the most likely IP address for the host's foreign agent?1. 127.0.0.1
2. 128.19.5.1
3. 128.18.5.2
4. 129.18.5.1
5. 128.18.5.1

 **5- Round Trip Time (RTT ) is the time duration between.**1. A sender sending the first bit of a message and the time the receiver receiving the first bit of a message
2. A sender sending the last bit of a message and the time the receiver receiving the last bit of a message
3. A sender sending the first bit of a message and the time the receiver receiving the last bit of a message
4. A sender sending a message to a receiver, and the time the receiver receiving an acknowledge from the sender
5. A sender sending a message to a receiver, and the time the sender receiving an acknowledge from the receiver

**Q3// Fill in the blanks with the correct word(s):** 1. **…………………….** is the maximum amount of data that can be transferred through a network during a specified period of time.
2. **…………………….** is the time duration between the first bit of a message / packet is transmitted at the sender and the first bit of a message is received at the receiver.
3. **…………………….** the permanent IP address of a mobile node while it stays at home network.
4. An Internet application needs to know the **………………..** and **……………….** of the remote entity with which it is communicating.
5. **..................………..** a visited network where a mobile node moves to.

**Q4//** **What is agent handoff? How does mobile IP handle handoff? How does Mobile IP improve it?**   **Q5// There are three wireless nodes P, Q and B located in the diagram show in Figure 1. Nodes P, Q and B are within the radio range of each other. Assume both P and Q has data to send to B, apparently at the same time:** Description: Description: C:\Users\Sangar\Desktop\Capture1.PNGFigure 1: Three wireless nodes.1. **Explain How MACA can handle this problem ?**
2. **If you think that the MACA is not good enough, do you think that we have another protocol that is better? and why it is better?**

**Q6// Fill in the blanks with the correct word(s):** 1. ………..………. in security means that the information has not been changed by a third party during its transmission from the sender to the receiver.
2. The definition of …………….......is that keep watching while you transmit, so that if someone else transmits at the same time, you can stop your transmission and try again later.
3. …………….. Is a protocol which is an alternative to the traditional CSMA
4. The message exchange of MACAW is………, ………, ……..,…….,……

**Q7//** State **TRUE** or **FALSE** a head of the following sentences, then correct the F**ALSE** ones.1. Packets of a correspondent travel to home agent first
2. The definition of Denial of service (DoS) is that an attacker may replay the registration request message after a mobile node already leaves a foreign network.
3. MACA has some problems which are possible collision over RTS and fairness issues
4. The basic message exchange which is used in MACA is RTS - CTS - DATA - ACK

**Q8// A)** A Compare and contrast each of the following concepts. Ad hoc network with Cellular Networks **B)** What is Mobile IP? How to maintain ongoing connection?**Q9//** Give the best answer for each of them: 1. What is minimal tunneling protocol?
2. What is IP in IP encapsulation?
3. What are the problems with MACA?

 **Q10 //**  **A)** State **TRUE** or **FALSE** a head of the following sentences, then correct the F**ALSE** ones 1. Mobility of Mobile IP is provided in cellular networks
2. Registration lifetime is one of the fields which are in the Registration advertisement message.

 3) In wireless sensor network the flowing of data ends at special nodes **called base station.**.4)In table-driven protocol ,every node maintains the network topology information in the form of routing tables by periodically exchanging routing information **B)** **Fill in the blanks with the correct word(s):** 1. ………… is used by a home agent to collect packet destined to a mobile node.
2. The basic packet exchange which is used in MACAW is ………. ……………….
3. …………… is a protocol in Bluetooth which is responsible for link setup between Bluetooth devices and ongoing link management

3- ..................……….. a visited network where a mobile node moves to. 4-……………………. the permanent IP address of a mobile node while it stays at home network..5/----------------------correspondent gets foreign agent address of mobile ,send directly to mobile.1. In mobile tunneling we have two types of encapsulation ----------------, -----------------
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