

TELE25892

Wireless Network Principles



I: Administrative Information **II: Course Details** **III: Topical Outline(s)**

Retain during the course and for future use when applying for credit at other educational institutions

Section I: Administrative Information

Program(s): Bach ApplCompSci - Mobile Comp

Program Coordinator(s): Magdin Stoica

Course Leader or Contact: Khaled Mahmud

Version: 20160906_00

Status: Approved (APPR)

Section I Notes: N/A

Total hours: 42.0

Credit Value: 3.0

Credit Value Notes: N/A

Effective: Fall 2016

Prerequisites: TELE10025

Corequisites: N/A

Equivalents: N/A

Pre/Co/Equiv Notes: N/A

Section II: Course Details

Detailed Description

Students describe the functions of the layered model for networks. They recognize the importance of the data link layer and its relation to wireless local area (WLAN) communications and acquire a fundamental understanding of cellular networks. They compare the media access mechanism of IEEE 802.3 for wired access with that of IEEE 802.11 for wireless access. They identify the differences between the collision detection method, for wired communication, and collision avoidance method, for wireless communications. Starting with an examination of the evolution of cellular networks and the ways in which voice-oriented systems accommodate data and video traffic, students then explore characteristics of the radio propagation medium, interference and their effect on data transmission and reception. Students compare and contrast the standards 802.11 a/b/n/g and learn the operating principles of GSM, UMTS and LTE cellular network architectures, protocol and logical channels. Through interactive lecture, discussion, readings, laboratories, assignments and case studies, students learn the relevance of wireless communications as a means to access network resources.

Program Context

Bach ApplCompSci - Mobile Comp

Program Coordinator(s): Magdin Stoica

This is the second required course in the wireless stream of courses in the program. Students build on their existing knowledge and skills from the foundations of wireless and networks and delve into greater depth and concentration in wireless networks in this course. This course serves as a foundation for more advanced topics in networks, wireless security and wireless application services.

Course Critical Performance and Learning Outcomes

Critical Performance:

By the end of this course, students will have demonstrated the ability to analyze wireless networks and the coexistence of cellular networks with wireless LANs and their implementation based on the IEEE 802.11 standards.

Learning Outcomes:

To achieve the critical performance, students will have demonstrated the ability to:

1. Explain how wireless networks are used to access network resources.
2. Explain the fundamental principles of cellular networks.
3. Identify the functions of wireless LAN in the networking layer model.
4. Study physical, logical and transport data channels, protocols, interfaces and network elements in the cellular network architecture.
5. Interpret the IEEE 802.11 wireless standards (architecture, MAC protocol, layer 2 frame).
6. Compare different Wireless LAN topologies and architectures.
7. Analyze parameters involved in the handover process in both cellular and WLAN systems.
8. Configure wireless access points AP and controllers to access an infrastructure.
9. Analyze downlink and uplink user throughput of GSM, UMTS and LTE networks.

Evaluation Plan

Students demonstrate their learning in the following ways:

Evaluation Plan: IN-CLASS

Exercises (3@3.33%) approx.	10.0%
weeks 2,4,8	
Assignments (2@10%)	20.0%
approx. weeks 5,10	
Research Paper approx. week	10.0%
12	
Exams (3@20%) approx.	60.0%
weeks 5,9,14	
Total	100.0%

Evaluation Notes:

To pass the course, students must achieve a 50% weighted average across the tests and the exams and at least 50% overall in the course.

Provincial Context

The course meets the following Ministry of Training, Colleges and Universities requirements:

Essential Employability Skills

Essential Employability Skills emphasized in the course:

N/A

Prior Learning Assessment and Recognition

PLAR Contact: Registrar's Office

Students may apply to receive credit by demonstrating achievement of the course learning outcomes through previous life and work experiences. This course is eligible for challenge through the following method(s):

- Challenge Exam
Notes:
- Portfolio
Notes:
- Other
Notes: Challenge exam, portfolio, and project are required for PLAR.

Section III: Topical Outline

Some details of this outline may change as a result of circumstances such as weather cancellations, College and student activities, and class timetabling.

Instruction Mode: In-Class

Professor: Multiple Professors

Resource(s):

Requirement	Type	Description
Required	Textbook	CWNA Certified Wireless Network Administrator Official Study Guide, Westcott, D., Coleman, D., Wiley, 4th ed., ISBN 9781119067764, 2015
Recommended	Textbook	CWTS Certified Wireless Technology Specialist Official Study Guide: (PW0-071), Bartz, Robert J., Sybex, 2nd ed., ISBN 978-1118359112, 2012
Recommended	Textbook	LTE, The UMTS Long Term Evolution: From Theory to Practice, Sesia, S., Toufik, I., & Baker, M., John Wiley & Sons Ltd., 2nd ed., ISBN 978-0470660256, 2011
Recommended	Textbook	LTE and the Evolution to 4G Wireless: Design and Measurement Challenges, Rumney, M., John Wiley & Sons Ltd., 2nd ed., ISBN 978-1119962571, 2013
Recommended	Textbook	Beyond 3G - Bringing Networks, Terminals and the Web Together, Sauter, Martin, John Wiley & Sons Ltd., ISBN 978-1-119-96532-9, 2011, eTextbook

Applicable student group(s): Bachelor of Applied Computer Science - Mobile Computing
Course Details:

1. Fundamentals of Data Link Layer

- Fundamentals of LAN Local Area Networks.
- Overview of network evolution (e.g., ALOHA, Ethernet, IEEE 802.3, IEEE 802.11)
- The LAN switch and the Wireless Access Point

2. The Wireless Physical Medium

- Principles and Fundamentals of Wireless Communications
- Radio Frequency Fundamentals
- Electromagnetic Waves, transmission lines and antennas
- Antenna concepts
- Effective irradiated power ERP
- Physical layer

3. IEEE 802.11 standards

- Wireless local area standards IEEE 802.11a, b, g, and n
- 802.11 Medium Access MAC Architecture and 802.11 Frames
- Industrial, Scientific and Medical ISM Spectrum
- Frequency bands 2.4 GHz and 5 GHz.

4. Cellular Networks

- Evolution of first, second and third generation cellular networks, 3GPP, ETSI
- Frequency allocation
- Cellular principle
- Network architecture and network elements
- Logical traffic and signalling channels
- GSM protocol and air interfaces
- Mobility management

5. UMTS and the Long Term Evolution Network

- LTE air interface
- LTE system architecture
- E-UTRAN architecture, functions and interfaces
- Physical and MAC layer concepts

- Radio resource management & mobility management
- Quality of service profile and parameters in LTE
- Cell capacity in downlink and uplink
- Per-user throughput in downlink and uplink

Note: The suggested number of weeks allocated to each module may vary depending on the professors and/or class requirements. The topics within each module are grouped semantically and are not meant to suggest a time sequence. A course plan must be provided by the professor identifying the class-by-class arrangement of topics.

Sheridan Policies

The principle of academic integrity requires that all work submitted for evaluation and course credit be the original, unassisted work of the student. Cheating or plagiarism including borrowing, copying, purchasing or collaborating on work, except for group projects arranged and approved by the professor, or otherwise submitting work that is not the student's own violates this principle and will not be tolerated. Students who have any questions regarding whether or not specific circumstances involve a breach of academic integrity are advised to review the Academic Integrity Policy and procedure and/or discuss them with the professor.

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