Macao Polytechnic University

Faculty of Applied Sciences

Master of Science in Big Data and Internet of Things

Module Outline

Academic Year <u>2022/2023</u>   Semester <u>2</u>

Learning Module	Communication Technology for Internet of Things		Class Code	COMP6124
Pre-requisite(s)	Nil			
Medium of Instruction	English		Credit	3
Lecture Hours	45 hrs	Lab/Practice Hours	0 hrs	Total Hours	45 hrs
Instructor	Dr. Benjamin Ng		E-mail	bng@mpu.edu.mo
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Description

This learning module provides a comprehensive study of the major communication technologies and emerging standards that enable applications on Internet of Things (IoT). It covers a wide range of technologies which IoT is expected to bridge in the formation of an autonomous communication network that supports smart applications and intelligent decision making. Topics include: cellular technologies (2G/3G/4G/5G) and M2M communications, covering their transmission characteristics, physical layer technologies, medium access protocols, and routing protocols; WiFi; Bluetooth; Radio Frequency Identification (RFID); Near Field Communication (NFC); Wireless Sensor Networks; Wireless Personal Area Networks including IEEE 802.15.4 and ZigBee, and the Low Power networks such as SigFox and LoRa.

Learning Outcomes

After completing the learning module, students will be able to:

1. Utilize knowledge in advanced communication technologies;   (SM1fl, D1fl)

2. Assess and contrast major communication technologies and emerging standards that enable Internet of thing applications;   (EA2fl, EP1fl, EP2fl, EP3fl)

3. Review and critique research literature in communication technologies for IoT; (EA2fl)

4. Devise advanced solutions to meet specific communication requirements appropriate for an IoT application.   (SM1fl, EA1fl, D3fl)

Content

1. Fundamentals of wireless communications   (10.5 hours)

    1.1   Antenna and radio wave propagation

    1.2   Fading in the IoT environment

    1.3   Channel capacity

    1.4   Signal encoding techniques

    1.5   Coding and error control

    1.6   Multiple access techniques

    1.7   Wireless sensor networks

2. Transmission Strategies in IoT   (3 hours)

    2.1   Cooperative communications

    2.2   Distributed-based and Cluster-based communications

3. Cellular network and 5G   (7.5 hours)

    3.1   2G/3G/4G

    3.2   5G Architecture

    3.3   5G Network Slicing

    3.4   5G PHY and Polar Coding

4. WiFi and IoT   (7.5 hours)

    4.1   IEEE 802.11

    4.2   IEEE 802.11ah

5. Bluetooth and NFC   (3 hours)

    5.1   Bluetooth

    5.2   NFC

6. Low-Power Network   (7.5 hours)

    6.1   6LoWan

    6.2   LoRa

    6.3   SigFox

7. Wireless Personal Area Network   (6 hours)

    7.1   IEEE802.15.4

    7.2   ZigBee

    7.3   Z-Wave

Teaching Method

Lectures and tutorials.

Attendance

Attendance requirements are governed by the "Academic Regulations Governing Master's Degree Programmes" of Macao Polytechnic University. Students who do not meet the attendance requirements for the module will not be permitted to sit the final examination and shall be awarded an 'F' grade.

Assessment

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 the pass score.

	Item	Description	AHEP3 LO	Percentage
1.	Test	Knowledge assessment	EA2fl, EP1fl, EP2fl, EP3fl	20%
2.	Projects	Knowledge assessment	SM1fl, EA1fl, EA2fl, D1fl, D3fl, EP3fl	40%
3.	Examination	3-hour written examination	SM1fl, D1fl, EP1fl	40%

Total Percentage: 100%

Students with an overall score of less than 35 in the coursework will fail the module even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination will fail the module even if the overall score for the module is 50 or above.

Teaching Material(s)

Textbook(s)

Daniel Chew (2018), *The Wireless Internet of Things: A Guide to the Lower Layers,* Wiley.

Reference

Reference book(s)

1. Osseiran, et al, (2016). *5G Mobile and Wireless Communications Technology*, Cambridge University Press.

2. Cirani, et al, (2018). *Internet of Things: Architectures, Protocols, and Standards*, Wiley.

3. Zaidi, et al, (2018). *5G Physical Layer: Principles, Models and Technology Components*, Academic Press.

4. Stallings, W. (2005). *Wireless Communications and Networks* (2nd ed.). Prentice Hall

5. Forouzan, B. A. (2013). *Data Communications and Networking* (5th ed.). McGraw-Hill.