CS4284: MOBILE COMPUTING

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Mobile Computing

Subject Code
CS - Computer Science
Course Number
4284

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CS3201 Computer Networks or
EE3009 Data Communication Protocols or
EE3016WANs and Communication Protocols or equivalent

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
EE4316 Mobile Data Networks

Part II Course Details

Abstract

This course studies basics and emerging topics in mobile computing, including basic communication theory of wireless mobile networks as well as the software development for mobile devices. Newly-emerging areas of mobile computing involving machine intelligence and Bot will also be studied in depth. Basics of mathematical theories and algorithms for communications will be introduced for various systems such as Internet, mobile cellular networks, wireless LAN, GPS global positioning systems. Augmented reality and QR code applications will be introduced. Software development tools for mobile apps and Bot technologies in mobile devices such as smartphones and tablets will be introduced as project-based learning.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify the basic problems, limitations, strengths and current trends of mobile computing.		x		
2	Explain the basics and fundamentals of communication theories and algorithms in mobile wireless networks.			x	
3	Create novel applications for supporting mobile computing and communications in mobile device technologies like smartphones and tablets.		x	x	
4	Explore emerging software paradigms such as Bot in supporting mobile services with machine intelligence.		x	x	
5	Develop an attitude to solve mobile computing problems with analytical solution and software programming development for mobile devices such as mobile apps for smartphones and tablets.		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	The lectures will present selected networking technologies such as Internet, mobile cellular networks, WiFi networks, and the intuition and theory behind them. The algorithms will be illustrated with both toy and real-world examples to motivate the students' understanding. Implementation details will also be discussed.	1, 2, 3, 4, 5	3 hours/week
2	Tutorials	The students will work on problem sets during the tutorial sessions to gain better understanding of the lecture material.	1, 2, 3, 4, 5	8 hours/semester
3	Assignments	Students will implement selected mobile computing network algorithms, apply them to small test problems, and interpret the results. Students can then observe the effectiveness of the algorithm, and evaluate the differences between various algorithms.	1, 2, 3, 4, 5	2 hours/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial	1, 2, 3, 4, 5	10	
2	Midterm exam	1, 2, 3, 4, 5	10	
3	Project	1, 2, 3, 4, 5	20	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task
Tutorial

Criterion
Assignment may include short factual questions and design exercises regarding the various principles of mobile computing. Assignment may include simple project / exercises. There would also be hands-on exercises.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Midterm Exam

Criterion
The mid-term quiz will include questions assessing the students' understanding on networking and mobile computing.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Project

Criterion
There would be hands-on and case study on network design in the project. Tasks may include mini programming project.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Final Exam

Criterion
The final exam and mid-term quiz will include questions assessing the students' understanding on mobile computing.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Mobile computing. Wireless communications and networks. Mobile Cellular networks. Wireless LAN. Medium access control. Wireless network power control algorithms. Augmented reality and QR code applications. Software development tools for mobile devices. Software programming of mobile apps and Bots.

Syllabus

· Basic issues in mobile computing: Fundamentals of computing and communications. Mathematical analysis of communications theory. Latest development and current trends of mobile computing.
· Networking technologies: The Internet. Mobile/wireless TCP. Wireless LAN. IEEE 802.11 protocol and algorithms.
· Mobile communications: Wireless communication theories. Multiple Access such as FDMA, CDMA and TDMA. Wireless cellular network optimization. Cell design and area planning for cellular networks. Sensor technologies on mobile computing devices.
· Mobile computing: Clocks in mobile applications. GPS global positioning systems.
· Mobile computing: QR Code applications. Augmented-reality applications. Machine intelligence and Bots.

- Mobile computing: Mobile app software programming. Software development tools and devices. Bot software programming. Mobile software development for project-based learning

Reading List

Compulsory Readings

	Title
1	Mischa Schwartz, Mobile Wireless Communications 1st Edition, Cambridge University Press, 2005

Additional Readings

	Title
1	David Holber, Hal Abelson, Ellen Spertus and Liz Looney. App Inventor, O'Reilly Media, 2014, 2nd edition. Online resources: http://appinventor.mit.edu
2	William Stallings. Wireless Communications & Networks. Pearson, 2nd edition.