QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Artificial Intelligence Department

Study plan No.	**2021/2022**		**University Specialization**		**Artificial Intelligence**	
Course No.	**0142431**		**Course name**		**Location based systems**	
Credit Hours	**3 hours**		**Prerequisite Co-requisite**		**Introduction to artificial intelligence**	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	☐ Mandatory requirements	☑ Elective requirements
Teaching style	☐ Full online learning		☑Blended learning		☐ Traditional learning	
Teaching model	☐ 2 Synchronous: 1asynchronous		☑2 face to face : 1synchronous		☐ 3 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
To be filled by the instructor					
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
To be filled by the instructor					

Brief description

The main objective of this course is to highlight the importance of accurate positioning and provide an understanding of the different technologies used to achieve this. The focus of this course is on location-based services, their applications in cellular networks.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Adrián Cardalda García Stefan Maier and Abhay Phillips, Location-Based Services in Cellular Networks from GSM to 5G NR, ARTECH HOUSE, 2020			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Hassan A. Karimi, "Advanced Location-Based Technologies and Services ",CRC Press, 2016 2. Miguel A. Labrador, Alfredo J. Perez, Pedro M. Wightman , Computer & Information Science Series Location-Based Information Systems: Developing Real-Time Tracking Application, Chapman & Hall/CRC , 2010			
Supporting websites				
The physical environment for teaching	☑ Class room	☐ labs	Virtual ☑ educational platform	☐ Others
Supporting people with special needs	----------			
For technical support	----------			

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

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No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Understand positioning fundamentals.	MK4
K2	Understand the applications of positioning to cellular networks both for emergency services and commercial use cases.	MK4
K3	Understand the different localization technologies.	MK4
	Skills	
S1	Positioning Overview, Applications, and Use Cases	MS2
S2	Positioning Technologies	MS2
	Competences	
C1	Have clear picture of the process initiated between a mobile phone and the cellular network related to a localization session.	MC1
C2	Have a clear understanding of the different technologies and algorithms involved related to LBS.	MC1

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
First exam	0	**0**	%20	0
Second / midterm exam	%30	**%30**	%20	30%
Participation / practical applications	0	**0**	10	30%
Asynchronous interactive activities	%30	**%30**	0	0
final exam	%40	**%40**	%50	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, and work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style*	Reference **
1	Introduction to Positioning in Cellular Networks	Lectures	1-19
2	Positioning Fundamentals	Lectures	21-45
3	Positioning Fundamentals	Lectures	21-45
4	Regulatory Positioning Requirements	Lectures	47-69
5	Regulatory Positioning Requirements	Lectures	47-69
6	Commercial Location-Based Services in LTE	Lectures	71-95
7	Commercial Location-Based Services in LTE	Lectures	71-95
8	**Midterm Exam** The Evolution of LBS for 5G	Lectures	97-126
9	The Evolution of LBS for 5G	Lectures	97-126
10	Assisted GNSS	Lectures	131-169
11	Assisted GNSS	Lectures	131-169
12	High-Precision GNSS in 5G	Lectures	171-196
13	High-Precision GNSS in 5G	Lectures	171-196
14	Terrestrial Positioning Technologies: Cellular Networks	Lectures	197-237
15	Terrestrial Positioning Technologies: Cellular Networks	Lectures	197-237
16	**Final Exam**		

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**
**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Self-Reading: History of Navigation	Chapter 1: Text book	Being able to present this topic.
2	Comparison between positioning measurements	Chapter 1: Text book	Understand the difference between different positioning measurements
3	Self- Reading Positioning Concepts	Chapter 2: Text book	Being able to present this topic.
4	Homework on Advanced Mobile Location	elearning.zuj.edu.jo	Being able to present this topic.
5	Self- Reading : ELS and other AML Enhancements	Chapter 3: Text book	Being able to present this topic.
6	HW : LTE Commercial LBS Applications	elearning.zuj.edu.jo	Present examples
7	Solving a work sheet on previous topics	elearning.zuj.edu.jo	Self-check before exam
8	**Mid Exam Estimated + Revision**		
9	HW: The Evolution of LBS for 5G	elearning.zuj.edu.jo	Present selected topics
10	HW: GPS to Multi-GNSS	elearning.zuj.edu.jo	Compare between GPS and GNSS
11	Self- Reading : Terrestrial Technologies and IMUs	Chapter 6: Text book	Being able to present this topic.
12	HW: Network-RTK	elearning.zuj.edu.jo	Define RTK
13	HW: PPP-RTK	elearning.zuj.edu.jo	Define PPP-PTK
14	Final Summary	Text Book	To present a final summary