Syrian Arab Republic		**الجمهورية العربية السورية**
Ministry of Higher Education		**وزارة التعليم العالـــي**
Syrian Virtual University		**الجامعة الافتراضية السورية**

"Mobile Communications Systems" Course Definition Form

1- Basic Information:

Course Name	Mobile Communications Systems
Course ID	CSS403
Contact Hours (Registered Sessions)	30
Contact Hours (Synchronized Sessions)	18
Mid Term Exam	-
Exam	1.5
Registered Sessions Work Load	30
Synchronized Session Work Load	18
Credit Hours	5

2- Pre-Requisites:

Course	**ID**
Digital Communications	CEE308
Mobile and Wireless Communications	CSS402

3- Course General Objectives:

This course aims to provide the student with the theoretical and technical background of mobile communications systems principles, to familiarize him with multiple access techniques, duplex modes and the concepts of quality of service and Tele-traffic, to enable him to acquire knowledge of mobile network components, geographical mobile network structure and channels, to teach him call setup procedure, speech processing and frequency planning, to enable him to describe solutions applied in mobile communication systems to address wireless channel problems, and to introduce the successive generations of mobile communications systems.

4- Intended Learning Outcomes (ILO):

Code	Intended Learning Outcomes
ILO1	Describing Multiple access techniques, duplex modes and frequency bands
ILO2	Recognizing Quality of service, Tele-traffic, and blocking concept
ILO3	Understanding GSM Network architecture and geographical structure
ILO4	Recognizing GSM channels and bursts types and frame structure
ILO5	Knowing speech processing and transmission/reception steps.
ILO6	Recognizing Wireless channel problems and solutions in GSM
ILO7	Understanding Frequency Planning
ILO8	Describing call setup and location updating procedures
ILO9	Understanding 2.5G mobile communications system structure and specifications
ILO10	Knowing 3G & 4G mobile communications systems structure and specifications

5- Course Syllabus (18 hours of total synchronized sessions)

- **RS:** Recorded Sessions**; SS:** Synchronized Sessions**;**

ILO	Course Syllabus	RS	SS	Type	Additional Notes
ILO1 ILO2	**Chapter 1: Introduction to mobile communications systems** 1- Introduction 2- 1G systems 3- 2G Systems 4- General comparison of different mobile communications systems 5- GSM Multiple access techniques 5-1- Time division multiple access 5-2- Frequency division multiple access 5-3- Frequency and time division multiple access 6- GSM duplex modes 7- GSM Frequency bands 8- GSM channel numbering 9- Quality of service concepts 10- Tele-traffic engineering fundamentals	3	3	☑ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises

ILO3	**Chapter 2: GSM network structure** 1- GSM network architecture 1.1- Radio access network 1.1.1- Mobile station 1.1.2- Base transceiver station 1.1.3- Base stations controller 1.2- Core network 1.2.1- Mobile switching center 1.2.2- Home location register 1.2.3- Visitor location register 1.2.4- Authentication center 1.2.5- Equipment Identity Register 2- GSM geographical network structure 2.1- The cell 2.1.1- the need to cell 2.1.2- Cell types 2.1.3- Base station identity 2.2- Location area 2.3- MSC Service area 2.4- PLMN Service area 2.5- GSM Service area	6	4.5	☑ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises
ILO4	**Chapter 3: GSM Channels** 1. Introduction 2. GSM frame structure 3. Logical channels 3.1. Traffic channel (TCH) 3.2. Broadcast channels (BCH) 3.2.1. Broadcast control channel (BCCH) 3.2.2. Synchronization channel (SCH) 3.2.3. Frequency correction channel (FCCH) 3.3. Common control channel (CCH) 3.3.1. Paging channel (PCH) 3.3.2. Access grant channel (AGCH) 3.3.3.Random access channel (RACH) 3.4. Dedicated Channel (DCH)	3	3	☑ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises

	3.4.1. Standalone dedicated control channel (SDCCH) 3.4.2. Slow associated control channel (SACCH) 3.4.3. Fast associated control channel (FACCH) 3.5. Burst types 3.5.1. Normal burst 3.5.2. Frequency correction burst 3.5.3. Synchronization burst 3.5.4. Access burst 3.5.5. Dummy burst				
ILO5	**Chapter 4: Speech Processing** 1. Introduction 2. Analog to digital conversion 3. Speech coding 4. Channel coding 5. Interleaving 6. Ciphering 7. Burst formatting 8. Modulation	3	1.5	☑ Exercises ☐ Assignments ☑ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises
ILO6 ILO7	**Chapter 5: Wireless communication problems & techniques** 1. Introduction 2. Wireless communication problems 2.1. Path loss 2.2. Shadowing 2.3. Multipath fading 2.4. Inter symbol interference 2.5. Propagation delay 2.6. Inter cell interference 3. GSM Wireless communication techniques 3.1. Channel coding 3.2. Adaptive multi rate 3.3. Interleaving 3.4. Multiple antenna 3.5. Adaptive equalization 3.6. Timing advance 3.7. Frequency hopping	3	1.5	☑ Exercises ☐ Assignments ☑ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises

	3.8. Power control 3.9. Discontinuous Reception /Transmission 3.10. Frequency reuse				
ILO8	**Chapter 6: GSM network procedures** 1. Introduction 2. Cell selection 3. Cell Reselection 4. Call setup 4.1. Interrogation & Paging 4.2. RR Connection Establishment 4.3. Service Request 4.4. Authentication 4.5. Ciphering Mode Setting 4.6. TMSI Reallocation 4.7. IMEI Check 4.8. Call Initiation 4.9. Assignment of Traffic Channel 4.10. User Alerting and Call Accepted 4.11. Call Release 5. Location updating 6. Handover procedure 6.1. Handover classification by equipment 6.2. Handover classification by reason 6.3. Intra BSC handover 6.4. Inter BSC handover 6.5. Inter MSC handover	6	1.5	☑ Exercises ☐ Assignments ☑ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises
ILO9 ILO10	**Chapter 7: Advanced mobile communications systems** 1. Switching technologies 2. Evolution from GSM to WCDMA 2.5. HSCSD 2.6. GPRS 2.7. ECSD 2.8. EDGE 2.9. 3G mobile communications systems 2.9.2. WCDMA specifications 2.9.3. Code division multiple access 2.9.4. WCDMA network structure	6	3	☑ Exercises ☐ Assignments ☑ Seminars ☐ Projects ☐ Practices ☐ Others	Solving exercises

	3. Evolution from WCDMA to LTE 3.1. High speed packet access (HSPA) 3.2. Evolved high speed packet access (HSPA+) 3.3. Long term evolution (LTE) 3.3.1. LTE specifications 3.3.2. LTE network structure				

6- Assessment Criteria (Related to ILOs)

ISC	Interactive Synchronized Collaboration		Ex	Exams		Rpt	Reports
PF2F	Presentations and Face-to-Face Assessments		PW	Practice Work			

ILO Code	ILO	Intended Results	Assessment Type				
			ISC	PW	Ex	PF2F	Rpt
ILO1	Multiple access techniques, duplex modes and frequency bands		✓		✓		✓
ILO2	Quality of service, Tele-traffic, and blocking concept		✓		✓		✓
ILO3	GSM Network architecture and geographical structure		✓		✓		✓
ILO4	GSM channels and bursts types and frame structure		✓		✓		✓
ILO5	Speech processing and transmission/ reception steps.		✓		✓		✓
ILO6	Wireless channel problems and solutions in GSM		✓		✓		✓
ILO7	Frequency Planning		✓		✓		✓
ILO8	Call setup and location updating procedures		✓		✓		✓
ILO9	2.5G mobile communications system structure and specifications		✓		✓		✓
ILO10	3G & 4G mobile communications systems structure and specifications		✓		✓		✓

7- Practice Tools:

Tool Name	Description
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8- Main References

GSM Advanced System Technique (Ericsson)
GSM and Personal Communications Handbook (Artech House)
GSM Mobile Communication Technology (DTU Fotonik)
نظم الاتصالات الخلوية، أسس ومبادئ (الدكتور هشام عرودكي)

9- Additional References

Understanding Cellular Radio (William Webb, Artech House)
GPRS for Mobile Internet (Artech House)
EDGE for Mobile Internet (Artech House)
UMTS-WCDMA System Engineering, RF Planning & Network Optimization (Telefocal)
An Introduction To LTE (Wiley, Christopher Cox)
Essentials of LTE and LTE-A (Cambridge)