

<p>Kingdom of Saudi Arabia Ministry of Higher Education <b>Qassim University</b> College of Engineering</p>		<p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p>
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## Cellular and Mobile Communication Systems

**College: College of Engineering**

**Department: Electrical Engineering Department**

**First: Course Definition**

**1- Course Code : EE 625**

**2- Units : 3**

**3 – Semester : First or Second**

**4 -Prerequisite : Background of 1<sup>st</sup> and 2<sup>nd</sup> Generation of Mobile technologies**

**5- Co-requisite**

**6- Location (if not on main Campus):**

**Second: Course Objectives**  
**Upon completion of this course, the student will:**

- 1.** Be acquainted with the role of cellular and mobile communications in frequency management issues.
- 2.** Be acquainted with different interference factors influencing cellular and mobile communications.
- 3.** Be able to efficiently use the background behind developing different path loss and/or radio coverage in cellular environment..

**Third: Course Specifications**

<b>1- Topics to be covered</b>		
Subject	No of Weeks	Units
<i>Cellular mobile radio systems: Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.</i>	<b>1</b>	<b>3</b>

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<p><b>Elements of cellular radio system design:</b> Co-channel Interference Reduction Factor, desired C/I from a normal case in an omni directional Antenna system, Cell splitting, consideration of the components of Cellular system</p>	3	9
<p><b>Interference :</b> Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.</p>	3	9
<p><b>Cell coverage for signal and traffic:</b> Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.</p>	3	9
<p><b>Frequency management and channel assignment:</b> Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.</p>	5	15

## 2- Course components (Total hrs in the Semester)

Lecture	Exercise or lab	Other
45	15	

## 3- Intended Learning Outcomes of the Course (ILO's)

### a. Knowledge

#### i) Description of the knowledge to be acquired:

##### - Knowledge and Understanding of:

- Basics of wireless communication systems.
- Various types of cellular systems.
- Large scale and fast fading propagation models
- Various propagation models

#### ii) Teaching strategies to be used to develop that knowledge

- Lectures
- Assignments

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- Discussions in the Class
  - Case study Report (data collection, Internet search, and reporting)
  - Mini project (Design - Hardware / Software / Measurements)
  - Summer Training, Supervised
  - Collaborative Training, Supervised
- iii) Methods of assessment of knowledge acquired**
- **Quizzes:** to assess understanding of wave propagation fundamentals
  - **Case Study (Report):** to assess technical report writing simulation abilities.-
  - **Discussion Groups:** to assess interactive and communication abilities.
  - **Midterm Exams:** to assess understanding of digital circuit fundamentals, problem solving and analytical and design capabilities.
  - **Final Exam:** to assess **understanding** of different aspects in the ILO's, design capabilities, analytical skills and ability to solve antenna problems.
  - **Group Mini project:** to assess **practical hands-on**, team work, report writing, ability to deal with suppliers, and design of antenna systems.

**b- Cognitive (Intellectual) Skills**

- i) Cognitive skills to be developed**
- Ability to analyze and simulate wireless system.
  - Ability to design wireless systems.
  - Ability to apply an appropriate propagation model suitable for a given environment.
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- ii) Teaching strategies to be used to develop these cognitive skills**
- Lectures
  - Assignments
  - Discussions in the Class
  - Case study Report (data collection, Internet search, and reporting)
  - Mini project (Design - Hardware / Measurements), Supervised
  - Summer Training, Supervised
  - Collaborative Training, Supervised
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**iii) Methods of assessment of students cognitive skills**

- **Quizzes:** to assess understanding of wave propagation fundamentals
- **Case Study (Report):** to assess technical report writing simulation abilities.
- **Discussion Groups:** to assess interactive and communication abilities.

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- **Midterm Exams:** to assess understanding of antenna fundamentals, problem solving and analytical and design capabilities.
- **Final Exam:** to assess **understanding** of different aspects in the ILO's, design capabilities, analytical skills and ability to solve antenna problems.
- **Group Mini project:** to assess **practical hands-on**, team work, report writing, ability to deal with suppliers, and design of antenna systems.

### ***c. Interpersonal Skills and Responsibility***

#### ***i) Description of the interpersonal skills and capacity to carry responsibility to be developed***

- Team work
- Ideas development and sharing with others

#### ***ii) Teaching strategies to be used to develop these skills***

- Lectures
- Assignments, at home
- Discussions in the Class
- Case study Report (data collection, Internet search, and reporting)
- Mini project (Design - Hardware / Software / Measurements), Supervised
- Summer Training, Supervised
- Collaborative Training, Supervised
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#### ***iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility***

- **Quizzes:** to assess understanding of wave propagation fundamentals
- **Case Study (Report):** to assess technical report writing simulation abilities.
- **Discussion Groups:** to assess interactive and communication abilities.
- **Midterm Exams:** to assess understanding of antenna fundamentals, problem solving and analytical and design capabilities.
- **Final Exam:** to assess **understanding** of different aspects in the ILO's, design capabilities, analytical skills and ability to solve antenna problems.
- **Group Mini project:** to assess **practical hands-on**, team work, report writing, ability to deal with suppliers, and design of antenna systems.

### ***d. Communication, Information Technology and Numerical Skills***

#### ***i) Description of the skills to be developed in this domain***

- Ability to understand fixed and mobile antenna system,
- Ability to design antenna systems, to perform a certain function

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- Acquiring the hands on of practical antenna measurement systems
- Technical report writing
- Ability to use shareware software available in the internet

**ii) Teaching strategies to be used to develop these skills**

- Assignments, at home
- Assignment Reports (data collection, Internet search, and reporting)-

**iii) Methods of assessment of students numerical and communication skills**

- **Case Study (Report):** to assess technical report writing simulation abilities.
- **Discussion Groups:** to assess interactive and communication abilities.
- **Group Mini project:** to assess **practical hands-on**, team work, report writing, ability to deal with suppliers, and design of antenna systems.

**e. Psychomotor (if applicable) & Other Non-cognitive Skills**

**i) Description of the psychomotor or other skills to be developed and the level of performance required**

- Not Applicable
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**ii) Teaching strategies to be used to develop these skills-**

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**iii) Methods of assessment of student's psychomotor skills**

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#### 4- Student Assessment Schedule

Serial	Assessment tool (test, group project, examination etc.)	Week due	Weight
1	Quiz	2, 6, 10	
2	Assignment	everyweek	
3	Term Paper	4, 12	
4	Mid-term exam	8	
5	Final exam	16	

#### 5- Student Support

- Office hours of at least 4 hours per week are offered
- Group news via Email, LinkedIn, etc
- Teaching assistance staff to offer extra support

#### 6- Learning Resources

##### **i) Essential Books (References)**

1. W.C.Y. Lee, "Mobile Cellular Telecommunications", McGraw Hill, 2<sup>nd</sup> Edn., 2006.
2. Gordon L. Stuber, "Principles of Mobile Communications", Springer International 2<sup>nd</sup> Edition, 2007.
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##### **ii) Course Notes**

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##### **iii) Recommended Books**

1. Stallings, *Wireless Communications and Networks*, Prentice Hall, 2002
2. R Schwartz, *Mobile Wireless Communications*, Cambridge University Press, 2005.
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##### **iv) Electronic Books & Web Sites-**

- Course materials are uploaded on the College Web-Site ([www.qec.edu.sa](http://www.qec.edu.sa)) to be available for the students.

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- v) Periodicals**
- - IEEE Trans. Vehicular Technology

**7- Course Evaluation and Improvement Processes**

- i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching**
- Questionnaires
  - Observing the students opinions recorded in the college student site
  - Appeal box
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- ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department**
- Periodical review of the teaching methods by both the department council and the education affairs vice dean.
  - Questionnaires
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- iii) Processes for Improvement of Teaching**
- Evaluation of the course outlines by external staff member from outside the university
  - Periodical contact with the different engineering authorities and industries for evaluating and getting their feedback and suggestions concerning the course outlines.
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- iv) Processes for verifying standards of student achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)**
- It is planned to:-
- Check marking of a sample of student work by an independent faculty member.
  - Exchange periodically, and remark a sample of assignments with a faculty member in one of distinguished institutes.

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**v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.**

Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university)

- Consequently, actions are to be taken to improve the course delivery when necessary.-
- Review of the course objectives, outcomes and curriculum at about 2 years span
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