

<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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## Advanced Digital Communication Systems

**College:** Engineering

**Department:** Electrical Engineering Department

### First: Course Definition

**1- Course Code:** EE621

**2- Units** 3

**3 – Semester**

**4 -Prerequisite**

**5- Co-requisite**

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

### Second: Course Objectives

1. To give students an appreciation of the spread spectrum modulation techniques.
2. To give students an understanding of Signal-Space Dimensionality, Processing Gain, and Probability of Error.
3. To ensure that students know different types of Multiple-Access Techniques: TDMA and CDMA.
4. To ensure that students be able to efficiently use error control coding techniques.
5. To give students an understanding of the combined source and channel coding techniques.

### Third: Course Specifications

1- Topics to be covered		
Subject	No of Weeks	Units
An introduction to different Multiple-Access Modulation Techniques and Error Control Coding Techniques.	1	3
Spread Spectrum Modulation Techniques	4	12
Multiple-Access Technique: TDMA	2	6
Multiple-Access Technique: CDMA	2	6
Error Control Coding Techniques: Cyclic & Convolution	4	12
Combined Source and Channel Coding Technique: Trellis-Coded Modulation	2	6

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## 2- Course components (Total hrs in the Semester): 45

Lecture	Exercise or lab	Other
45	<p>Exercise      1 X 15 =15</p>	

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

### a. Knowledge

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

- Principle of operation of Direct-Sequence Spread Spectrum with Coherent Binary Phase-Shift Keying
- Principle of operation of Frequency-Hop Spread Spectrum
- Fundamentals of TDMA and CDMA Wireless Communication Systems
- Principle of operation of Cyclic Codes, Convolutional Codes, Maximum Likelihood Decoding of Convolutional Codes
- Fundamentals of Trellis-Coded Modulation and Turbo Codes

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

- Lectures
- Assignments, at home
- Discussions in the Class
- Case study Report (data collection, internet search, presentation and reporting)

#### iii) Methods of assessment of knowledge acquired

- **Quizzes:** to assess understanding of the course knowledge.
- **Assignment reports:** to assess ability to answer some comprehensive questions.
- **Midterm Exams:** to assess understanding of the course knowledge.
- **Final Exam:** to assess understanding of the course knowledge.

### b- Cognitive (Intellectual) Skills

#### i) Cognitive skills to be developed

- The ability to analyze different types of Spread Spectrum Modulation Techniques

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- The ability to select the suitable Multiple-Access Modulation Techniques and Error Control Coding Techniques

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

- Lectures
- Assignments, at home
- Discussions in the Class
- Case study Report (data collection, Internet search, presentation and reporting)

**iii) Methods of assessment of students' cognitive skills**

- **Quizzes:** to assess the ability to solve quickly some problems.
- **Assignment reports:** to assess the ability to solve and analyze some comprehensive problems.
- **Midterm Exams:** to assess the ability to discuss, analyze, and solve the associated problems.
- **Final Exam:** to assess the intellectual skills such as analytical skills and ability to solve either modulation or coding problems.

**c. Interpersonal Skills and Responsibility**

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

- Team work in mini projects.
- Ideas development and sharing with others

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

- Assignments, at home
- Discussions in the Class
- Case study Report (data collection, Internet search, presentation and reporting)

**iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility**

- **Unified reports and Seminars:** to assess the integration done by the student in a unified report and presentations.
- **Oral Group Exams:** to assess interactive and communication abilities.

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

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

- Use of the internet search
- Technical report writing

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

- Assignments, at home
- Case study Report (data collection, Internet search, presentation and reporting)

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

- **Assignment Reports:** to assess technical report writing abilities.
- **Discussion Groups:** to assess interactive and communication abilities.

**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**

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- **NOT Applicable**

**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**

Assessment	Assessment task (test, group project, examination etc.)	Week due	Weight of
1	Quiz 1	Week 2	2%
2	Assignment 1	Week 4	2%
3	Quiz 2	Week 4	2%
4	Quiz 3	Week 5	2%
5	Mid Term Exam1	Week 6	15%
6	Quiz 4	Week 8	2%
7	Quiz 5	Week 9	2%
8	Mid Term Exam2	Week 12	15%
9	Assignment 2	Week 13	2%
10	Continuous class evaluation	1 <sup>st</sup> -15 <sup>th</sup>	2%
11	Group reports and seminars	Week 13	2%
12	Attendance	1 <sup>st</sup> -15 <sup>th</sup>	2%

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13	Final Exam	Week 16	50%
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## 5- Student Support

Six Office hours per week are offered by the instructor to aid the students and support them.

## 6- Learning Resources

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

- Simon Haykin, *Communication Systems*, John Wiley, 4<sup>th</sup> edition, 2001-
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### **ii) Course Notes**

- PP Slides are edited by the instructor as teaching aided tool to be used on the smart board available in each classroom.
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### **iii) Recommended Books**

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- [1] Burr, A. *Modulation and Coding for Wireless Communications*, Prentice-Hall 2001.
- [2] Sklar, B. *Digital Communications Fundamentals and Applications*, Prentice Hall, 2001.
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### **iv) Electronic Materials & 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.-

### **v) Periodicals**

- IEEE transactions on Communications
- IEEE transactions on Selected areas on Communications
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## 7- Course Evaluation and Improvement Processes

### **i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching**

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- Questionnaire ◊
- Observing the students opinions recorded in the college student site
- Appeal box
- Carrying out extensive questioners by a sample of the distinguished students just after the graduation from the college.

**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-
- Questionnaire ◊
- Observing the students opinions recorded in the college student site
- Appeal box

**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.

**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)**

- • 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 King Saud University (KSU)

**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 each 2 years.