

<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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## Fiber Optic Communications

**College: College of Engineering**

**Department: Electrical Engineering Department**

**First: Course Definition**

**1- Course Code : EE 628**

**2- Units : 3**

**3 – Semester : First or Second**

**4 -Prerequisite : Background of Snell's law**

**5- Co-requisite**

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

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

- 1. Be able to explain** the operation of optical fibers and their characteristics such as attenuation and dispersion.
- 2. Enhance an understanding** of the operation of active optoelectronic semiconductor components such as diode lasers, Light Emitting Diodes (LEDs) and photodetectors.
- 3. Be given a description** of the operating principles of optical components such as couplers and optical amplifiers.
4. Understand the operation of Wavelength Division Multiplexed (WDM) optical networks

**Third: Course Specifications**

<b>1- Topics to be covered</b>		
Subject	No of Weeks	Units
Optical Fibers (Structures, Waveguiding, Fabrication, types)	<b>1</b>	<b>3</b>

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<b>signal Degradation in Optical Fibers</b> (Attenuation, Absorption, Dispersion)	<b>2</b>	<b>6</b>
<b>Power Launching and Coupling</b> (Power coupling calculation, Numerical Aperture, Connectors)	<b>2</b>	<b>6</b>
<b>Optical Sources</b> (LEDs, LASERs)	<b>2</b>	<b>6</b>
<b>Photodetectors</b> (PIN, APD)	<b>1</b>	<b>3</b>
<b>Concepts and Components</b> (Scattering Matrix Representation, Fiber Grating Filters, Filters)	<b>2</b>	<b>6</b>
<b>Optical Amplifiers</b> (Applications, Pumping, Wavelength Converters)	<b>2</b>	<b>6</b>
<b>Optical Networks</b> (Network Topologies, Nonlinear Effects on Network Performance)	<b>2</b>	<b>6</b>
<b>Measurements</b> (Optical Spectrum Analyzers, Dispersion Measurements)	<b>1</b>	<b>3</b>

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

Lecture	Exercise	Other
<b>45</b>	<b>15</b>	

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

### a. Knowledge

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

##### - Knowledge and Understanding of:

- The importance of optical communication systems.
- Various types of optical sources and detectors.
- Methods used to analyze optical fibers.
- Operation of optical amplifiers and measurement techniques used in optical communication systems.

#### *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 optical system.
  - Ability to design optical systems.
  - Ability to use an appropriate optical source/detector suitable for a given optical system.
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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**

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<i>Serial</i>	<i>Assessment tool (test, group project, examination etc.)</i>	<i>Week due</i>	<i>Weight</i>
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)**  
Gerd Keiser, “Fiber Optic Communications” (Third Edition), , McGraw-Hill, 2006.
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- ii) Course Notes**
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#### iii) Recommended Books

1. C. Yeh, and F. I. Shimabukuro, The Essence of Dielectric Waveguides, Springer, 2008.
  2. K. Okamoto, Fundamentals of Optical Waveguides, Academic Press, 2006
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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. Lightwave Technology

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**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.

***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.

***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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