Course Specifications

Program(s) on which this course is given:	Electronics & Electrical Communications Engineering
Major or Minor element of programs:	Major
Department offering the program:	Electronics & Electrical Communications Engineering
Department offering the course:	Electronics & Electrical Communications Engineering
Academic year / Level:	Fourth
Date of original/modified specification approval:	2003
Semester of course offering:	Second

A- Basic Information

1.a. Title:	Optical Fiber Communications			**1.b. Code:**		ELC 445		
2. Units/Credit hours per week:	2.a. Lectures	4	2.b. Tutorial	0	2.c. Practical	0	2.d. Total	4

B- Professional Information

1. Overall Aims of the Course:

Introduce optical fiber communications and different types of optical fibers using ray representation and modal analysis in step and graded index optical fibers. Signal degradation in fibers is also studied. Optical receivers budget is discussed. Semiconductor optical sources (SC laser diodes, light emitting diodes) together with photo detectors (PIN and avalanche photo diodes (APD)) are studied in depth.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding

1. Describe the concepts of optical communications in comparison to traditional electrical systems (1.7).
2. Identify and tabulate the sources of signal distortion in optical fibers (1.7).
3. Identify and tabulate the sources of signal attenuation in optical fibers (1.7).
4. Comprehend the fundamentals of semiconductor optical sources (Light-emitting and laser diodes) used in communication systems and be capable of characterizing there parameters and drive circuits (1.7).
5. Comprehend the fundamentals of semiconductor optical detectors (PIN and Avalanche photodiodes) used in communication systems and be capable of characterizing there parameters (1.7).

b) Intellectual Skills

1. Derive and analyze the physics of light confinement in multimode fibers using geometrical optics approximations (3.1, 3.4).
2. Derive, analyze and interpret the physical meaning of the dispersion formulae in single and multimode fibers using electromagnetic model (3.1, 3.4).
3. Analyze the sources of signal distortion in optical fibers (3.1, 3.4).
4. Analyze the sources of signal attenuation in optical fibers (3.1, 3.4).
5. Calculate the effect of the sources of signal degradation in fibers on system performance (3.7).

c) Professional and Practical Skills

	1. Design circuits incorporating optical sources and detectors (2.4) 2. Methodology of component specification (2.5) 3. Methodology of choice of system components for a given system application (2.5)
	d) General and Transferable Skills
	1. Conduct research and prepare presentation on selected topics related to optical communications (4.1, 4.6, and 4.9). 2. Methodology of component specification (4.9). 3. Methodology of choice of system components for a given system application (4.9). 4. Develop and implement numerical method to solve the non-linear dispersion relation for EH, HE and LP modes in step-index fibers (4.2).

3. Contents

Topic	**Total hours**	**Lectures**	**Tutorial/ Practical**
1. Optical versus radio frequency communications.	2	2	0
2. Different types of optical fibers.	4	4	0
3. Ray representation in optical fibers.	6	6	0
4. Modal analysis in step and graded-index optical fibers.	14	14	0
5. Signal attenuation and distortion.	14	14	0
6. Optical receivers.	4	4	0
7. Optical properties of III-V semiconductors Emitters: SC laser diodes & light emitting diodes.	6	6	0
8. Photo detectors: PIN & avalanche photo diode (APD).	6	6	0

4. Teaching and Learning Methods	Lectures (Y)	Practical Training/ Laboratory (N)	Seminar/Workshop (Y)
	Class Activity (N)	Case Study (Y)	Numerical Projects (Y)
	E-learning (Y)	Assignments /Homework (Y)	Other:

5. Student Assessment Methods

5.a. Method	**To assess (with reference to the ILOs)**
- Class Test	a1, b1
- Assignments & Presentations	a1, a2, a3, b1, b2, d1
- Numerical Assignment	d4
- Mid-term Exam	a1, b1, b2
- Final Exam	a1-a5, b1-b5 (Comprehensive)
5.b. Assessment Schedule	**Week**
-Assessment 1; Class test	4
-Assessment 2; Assignments & Presentations	Weekly
-Assessment 3; Mid-term exam	8
-Assessment 4; Numerical Assignment	11
-Assessment 5; Final exam	15

5.c. Weighting of Assessments	
-Mid-Term Examination	20 %
-Final-term Examination	70 %
-Semester Work	10 %
-Total	100 %
6. List of References	
6.a. Course Notes: **Optical Fiber Communications (Contact)** *Hosted by:* http://www.egypteducation.org/moodle	
6.b. Essential Books (Text Books)	
G. Keiser, "Optical Fiber Communications" Third Edition, McGraw-Hill, 2007	
6.c. Recommended Books.	
None	
6.d. Periodicals, Web Sites, … etc	
7. Facilities Required for Teaching and Learning	
• Class room should be equipped with projector (Data Show)	
Course Coordinator:	**Dr. Hanna A. Kirolous**
Head of Department:	**Prof. Dr. Mahmoud El-Hadidi**
Date:	**May, 24th 2011**