Faculty of Engineering
at Shoubra

Model No.12
Course Specifications : **Semiconductor Optoelectronics**

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

1- Course Data

Course Code : ECE345 Course Title : Semiconductor Optoelectronics Study Year : Fourth Year
Specialization : Electronic and Communication Engineering
Teaching Hours:
Lecture : 4 Tutorial : Practical : 2

2- Course Aim

For students undertaking this course, the aims are to:

2.1- Acquire the background needed for a deep understanding of the basics of components of optical fibers communications systems.
2.2- Describe and assess the performance optical fibers systems: passive and active components
2.3- Demonstrate the physical limitations on the characteristics of an optical fiber communication system.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will be able to:

a.1) Apply the physical concepts in the area of optical electronics.(a20)
a.2) Understand the operation of different types of optical sources and detectors.(a21)
a.3) Understand the foundations of semiconductor LEDs and lasers.(a23)
a.4) Analysis and assessement of some simple optical sources and detectors.(a26)
a.5) Define usage of optical fiber. (a27)
a.6) Define optical communication systems. (a30)

b- Intellectual Skills

At the end of this course, the students will be able to:

b.1) Select appropriate solutions for optical sources and detectors.(b3)
b.2) Think in a creative and innovative way in solving some design problems related to optoelectronics.(b4)
b.3) Solve some simple practical engineering design problems in optical communications.(b8)
b.4) Plan, conduct and write advanced reports, and studies.(b15)

c- Professional Skills

On completing this course, the students are expected to be able to:

c.1) Apply knowledge of mathematics, science, and engineering practice to solveengineering problems faced in optical transmission and detection.(c1)
c.2) Use computational facilities and techniques, to design optoelectronics sysstems.(c5)
c.3) Prepare and present technical reports.(c12)
c.4) Use appropriate mathematical and analytical methods and tools in the design and evaluation of optical systems.(c13)

d- General Skills

At the end of this course, the students will be able to:

d.1) Search for information and engage in self learning semiconductor Optoelectronics.(d7)
d.2) Write technical reports and presentation.(d10)
d.3) Develop skills related to creative and critical thinking as well as problem solving.(d12)

4- Course Contents

No.	Topics	No of hours
1	Topics from semiconductor technology	8
2	Band structure	4
3	Band structure and junction devices	4
4	Basic structure of light emitting diode (LED)	4
5	Internal quantum efficiency	4
6	Modulation characteristics of LEDs. And Transient response of LEDs.	4
7	Basic structure and analysis of a laser diodes (LD)- Power-current characteristics	4
8	The P-I-N photodetector	4
9	Response characteristics of photodetectors	4
10	Avalanche photodetector (APD)	8

5- Teaching and Learning Methods

5.1-modified Lectures
5.2- Case study
5.3- Class activity
5.4- Assignments

6- Teaching and Learning Methods of Disables

Nothing

7- Student Assessment

a- Student Assessment Methods

1	Assessment to assess knowledge and intellectual skills.
2	Quizzes to assess knowledge, intellectual.
3	Mid-term exam to assess knowledge, intellectual
4	Final exam to assess knowledge, intellectual.

b- Assessment Schedule

No.	Assessment	Week
1	Assessments	3, 5, 7,10, 12
2	Assessment 2 Quizzes	4, 6, 13
3	Assessment 3 Mid-term exam	8
4	Assessment 5 Final exam	16

c- Weighting of Assessments

Assessment	Weight
Mid_Term Examination	20 %
Final_Term Examination	70 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	10 %
Other types of assessment	0 %
Total	100 %

8- List of References

a- Course Notes

NA

b- Books

1-"Fiber-Optic Communication Systems" Third Edition, GOVIND P. AGRAWAL, John Wiley & Sons, Inc.

2-W. K. Pratt, "Laser Communication Systems", Wiley, New York

3- L. Kazovsky, S. Bendetto, and A. E.Willner, "Optical Fiber Communication Systems", Artec House, Norwood, MA,

c- Recommended Books

1- G. Einarrson, "Principles of Lightwave Communication Systems", Wiley, New York.

2- N. Kashima, Passive Optical Components for Optical Fiber Transmission, Artec House، Norwood, MA

Course Instructor:

- Course Coordinator : Assoc. Prof. Dr. M. Lotfy Rabeh

- Head of Department : **Prof. Dr. Sayed Abo -Elsood Ward**

Faculty of Engineering at Shoubra

Model No.11A
Course Specifications : **Semiconductor Optoelectronics**

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

Matrix of Knowledge and Skills of the course

No.	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Topics from semiconductor technology	1	a1,a3,a5,a6	B1	C1	
2	Band structure	2	a2	B2	C1	d1
3	Band structure and junction devices	3	A3, a4		C4	
4	Basic structure of light emitting diode (LED)	4			C4	D1,d2
5	Internal quantum efficiency	5			C4	D1,d2
6	Modulation characteristics of LEDs. And Transient response of LEDs	6	A3,a4		C4	
7	Basic structure and analysis of a laser diodes (LD)- Power-current characteristics	7	A3, a4		C4	
8	Mid term exam	8	a1, a3			
9	The P-I-N photodetector	9	a1, a3		c1	
10	Response characteristics of photodetectors	10	A1,a3		C1,c4	
11	Avalanche photodetector (APD)	11	A1,a3		c1	
12	Modulation characteristics and Bandwidth of Laser Diodes.	12	A1,a2,a3,a5,a6			
13	The P-I-N photodetector	13	A1,a3		c1	
14	Response characteristics of photodetectors	14	a1, a3		c1, c4	
15	Final exam	15	a1			d1

Course Instructor:

- Course Coordinator : Assoc. Prof. Dr. M. Lotfy Rabeh

- Head of Department : Prof. Dr. Sayed Abo -Elsood Ward

Matrix of course content and ILO's

Course Title: **Semiconductor Optoelectronics** **Code**: ECE345
Lecture: 4 **Tutorial**: **Practical**: 2 **Total:** 6
Program on which the course is given: B.Sc. Electrical Engineering (Communications)
Major or minor element of program: Major
Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Forth** Year / **Second** Semester 2014/2015
Date of specifications approval: 20/6/2010

Course content	a1	a2	a3	a4	a5	a6	B1	B2	B3	B4	c1	c2	c3	C4	D1	D2	D3
Topics from semiconductor technology	✓		✓		✓	✓	✓				✓						
Band structure		✓						✓			✓				✓		
Band structure and junction devices			✓	✓										✓			
Basic structure of light emitting diode (LED)														✓	✓	✓	
Internal quantum efficiency														✓	✓	✓	
Modulation characteristics of LEDs. And Transient response of LEDs.			✓	✓	✓	✓								✓			
Basic structure and analysis of a laser diodes (LD)- Power-current characteristics			✓	✓										✓			
The P-I-N photodetector	✓		✓								✓						
Response characteristics of photodetectors	✓		✓								✓			✓			
Avalanche photodetector (APD)	✓		✓								✓						

Matrix of course aims and ILO's

Course Title: **Semiconductor Optoelectronics** **Code**: ECE345
Lecture: 4 **Tutorial**: **Practical**: - **Total:** 6
Program on which the course is given: B.Sc. Electrical Engineering (Communications)
Major or minor element of program: Major
Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Fourth** Year / **Second** Semester 2014/2015
Date of specifications approval: 20/6/2010

Course aims	a1	a2	a3	a4	B1	B2	B3	B4	c1	c2	c3	C4	D1	D2	D3
Acquire the background needed for a deep understanding of the basics of components of optical fibers communications systems	✓		✓			✓			✓		✓			✓	
Describe and assess the performance optical fibers systems: passive and active components .		✓			✓		✓						✓	✓	
Analysis of the transistor circuits at low, medium and high frequencies using bode plots and frequency response.	✓		✓	✓					✓	✓					✓
Demonstrate the physical limitations on the characteristics of an optical fiber communication system	✓				✓			✓					✓		

Course Instructor:

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