



KAU

**KING ABDULAZIZ UNIVERSITY
ACADEMIC ASSESSMENT UNIT**

COURSE PORTFOLIO

FACULTY OF SCIENCE

PHYSICS DEPARTMENT

COURSE NAME: *Physics of Semiconductors*

COURSE NUMBER: *Phys 472*

SEMESTER/YEAR: *1st / 1438 H*

DATE: *Thu Alhijjah-1438H*

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Instructor Information

- Name of the instructor: Dr. Hala A Al-Jawhari
- Office location: Faculty of Science, 3rd floor, Room No. (108).
- Office hours:

Sunday	Monday	Tuesday	Wednesday	Thursdays
-	11-12:30	11-12:30	11-12:30	11-12:30

- E-mail address: haljawhari@kau.edu.sa

Course Information

- Course name and number: Physics of Semiconductors - Phys (472)
- Course meeting times & places:

	Time	Room
Lectures	8-9:30 Mon & Wed	104A

- Course prerequisites and requirements: Phys 471 & Phys 312

- Description of the course :

The course consists of two parts:

Part I : Fundamentals principles of Semiconductors:

- Electronic energy bands
- Electronic effects of doping impurities
- Charge carrier transport properties

Part II : The operation principles for semiconductor devices

- p-n junctions and Diodes
- Metal-semiconductor Contacts – Schottky Diodes
- Metal-Oxide-Semiconductor Transistor (MOSFET)

Course Objective

The general goal of this course is to allow the undergraduate students to understand the fundamentals physics of semiconductor materials and the operation of some basic semiconductor devices.

Learning Resources

- The primary textbook for the course is


Electronic Materials & Devices, by S. Kasap, 3rd ed (2006).

Additional references that may be helpful to students in this course:

- 1- *Semiconductor Physics & Devices Basic Principles* by D. Neamen, 4th ed (2011).
- 2- *Physics of Semiconductor Devices*, by S. M. Sze (1985).
- 3- <https://www.doitpoms.ac.uk/tlplib/semiconductors/index.php>

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Course Requirements and Grading

 **Student assessment:**



Class Presentation	25%
H.W	15%
Mid EXAM	20%
Final EXAM	40%

The project assignment is to prepare a 30-40 minute class **presentation** about one of the semiconductor devices.

Suggested topics:

- * *Schottky Diodes*
- * *MOSFETs*
- * *Solar Cells*
- * *Photodetectors*
- * *LEDs*
- * *Laser Diodes*

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Detailed Course Schedule

<i>Week</i>	<i>Topic</i>	<i>Readings</i>	<i>Due</i>
<i>1</i> (29/12/38)	<i>Introductory Lecture</i>		
<i>2</i>	<i>Band Theory of Solids & Semiconductors</i>	<i>4.2 & 4.3</i>	
	<i>Effective mass & Direct vs Indirect Bandgap Semiconductors</i>	<i>4.4 & 5.11</i>	
<i>3</i>	<i>Density of State & Statistical distribution</i>	<i>4.5 & 4.6.2</i>	
	<i>H.W #1</i>		
<i>4</i>	<i>Carriers in Intrinsic Semiconductors</i>	<i>5.1</i>	
	<i>Carriers in Extrinsic Semiconductors</i>	<i>5.2</i>	
<i>5</i>	<i>Temperature dependence of Conductivity</i>	<i>5.3.1</i>	
	<i>Carrier Transport- (Drift)</i>	<i>5.3.2 & 5.3.3</i>	
<i>6</i>	<i>Carrier Transport- (Diffusion)& Einstein relation</i>	<i>5.5</i>	
	<i>The p-n Junction Diode-Ideal Characteristics</i>	<i>6.1</i>	
<i>7</i>	<i>The p-n Junction Diode (cont.)</i>	<i>6.2-6.5</i>	
	<i>H.W #2</i>		
<i>*** Mid EXAM ***</i>			
<i>8</i>	<i>Metal-Semiconductor Heterojunctions: Schottky Diode & Ohmic Contacts</i>	<i>Students Presentations</i>	
<i>9</i>	<i>Metal -Oxide-Semiconductor Field-Effect Transistor (MOSFET)</i>		
<i>10</i>	<i>Solar Cell</i>		
<i>11</i>	<i>Photodetector</i>		
<i>12</i>	<i>Light Emitting Diode (LED)</i>		
<i>13</i>	<i>Laser Diodes</i>		
<i>14</i>	<i>H.W #3</i>		
<i>*** FINAL EXAM ***</i>			