CCE201: Solid State Electronic Devices

Lecture 01: Introduction

Prepared By

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Assistant Professor, CCE department

Course Information

Course Name: **Solid State Electronic Devices**

Course Code: CCE201

Course Materials are on my website:

http://www.bu.edu.eg/staff/sherifsalah3

Contact me

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My rules

- No eating
- No drinking
- Silence except for asking questions
- Shutdown your Mobile, Tablet, etc. and put in your pocket.

Course meeting time & Location

		Number / week	Day	Time	Location
Contact hours	lectures	2 h	Saturday	09:00-11:00	Room ??
	tutorial	2 h	Saturday	11:00-13:00	Room ??

CCE201: Course Info

Course Title	**Solid State Electronic Devices**					
Course Code	CCE201					
Credit Hours	3					
Contact Hours	Lecture	2	Tutorials	2	Lab.	-
Prerequisite(s)	EMP104					
Topics	Basics of semiconductor physics – Fermi-Dirac distribution – Carriers concentrations – Intrinsic and Extrinsic materials – Charge neutrality – Currents in Semiconductors (drift current – diffusion current) – Semiconductor parameters (mobility, Scattering, lifetime) – Hall effect. – PN junction theory – Diode IV characteristics – large and small analysis – Analog and digital diode applications (Rectifiers, Clipping circuits, Clamping Circuits, multipliers) – Special purpose diodes (Light emitting diodes, photo diodes, Zener diode and its applications)– Basics of Bipolar junction transistors (BJT) and field effect transistors (FET) – physical operations, characteristics, specifications.					

Course Assessment

Assessment Type	Percentage	Time
Midterm1	30%	Week 07
Midterm2	20%	Week 12
Attendance, Assignments	10%	
Final Exam	40%	Week 16
Total mark	100%	

Conditions of the success are:

1- getting 60% of the total mark.

2- getting at least 30% of the full mark of the final exam.

Course Assessment

Percentage	Grade	Points
Score ≥ 97%	A+	4
93% ≤ Score < 97%	A	4
89% ≤ Score < 93%	A-	3.7
84% ≤ Score < 89%	B+	3.3
80% ≤ Score < 84%	B	3
76% ≤ Score < 80%	B-	2.7
73% ≤ Score < 76%	C+	2.3
70% ≤ Score < 73%	C	2
67% ≤ Score < 70%	C-	1.7
64% ≤ Score < 67%	D+	1.3
60% ≤ Score < 64%	D	1
Score < 60%	F	0

Syllabus

Weeks	Topics
1	Introduction
2	Basics of semiconductor physics
3	Intrinsic & Extrinsic semiconductors
4	Carrier Transfer
5	PN-junction
6	PN-diodes and their applications
7	Midterm 1
8	Special purpose diodes
9	Bipolar junction transistor (BJT) I
10	Bipolar junction transistor (BJT) II
11	Bipolar junction transistor (BJT) III
12	Midterm 2
13	FET transistor I
14	FET transistor II
15	Revision

Syllabus

Text Book

S. M. Sze (2001). **Semiconductor Devices: Physics and Technology,** Wiley & So., ISBN 0471333727.

Recommended references supporting the course

B. Streetman, S. Banerjee (1999).**Solid State Electronic Devices,** Prentice Hall, ISBN 0130255386.

Robert L. Boylestad, Louis Nashelsky, (2013) **Electronic devices and circuit theory,** 11th edition, Pearson Education

Neamen D.A., (2007), **Microelectronics Circuit Analysis and Design**, McGraw Hill.

Simulators

- Proteus
- OrCAD
- SPICE
- Online simulator

http://www.falstad.com/circuit/index.html

ILOS

- Theory
- Analysis
- Simulation
- Implementation

ILOS

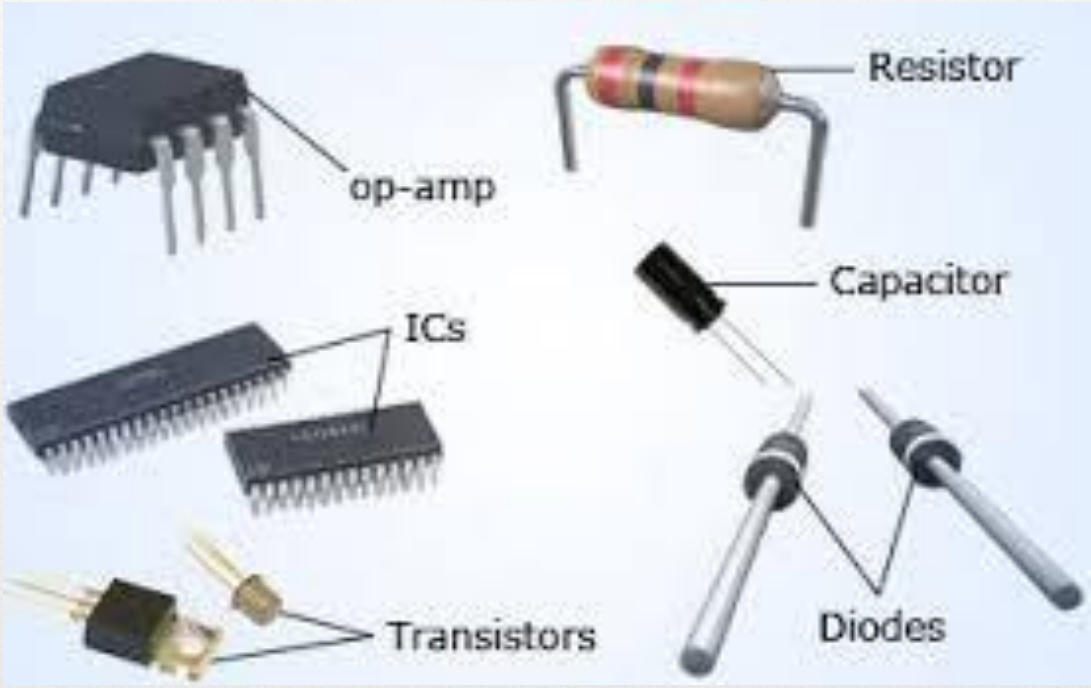
Upon successful completion of the course, students will be able to:

- Acquire some understanding in the fundamental electric and electronics principles.
- Describe the operation and i-v characteristics of diodes and transistors.
- Solve basic problems in electronic circuits.
- Implement different applications using basic electronic devices (diodes and transistors).
- Read and understand the datasheets of diodes and transistors to use the suitable parts in design.
- Design and analyze electronic circuits use computer packages (simulators).
- Acquire better skills in performing the laboratory experiments.
- Work as a team in laboratory sessions.

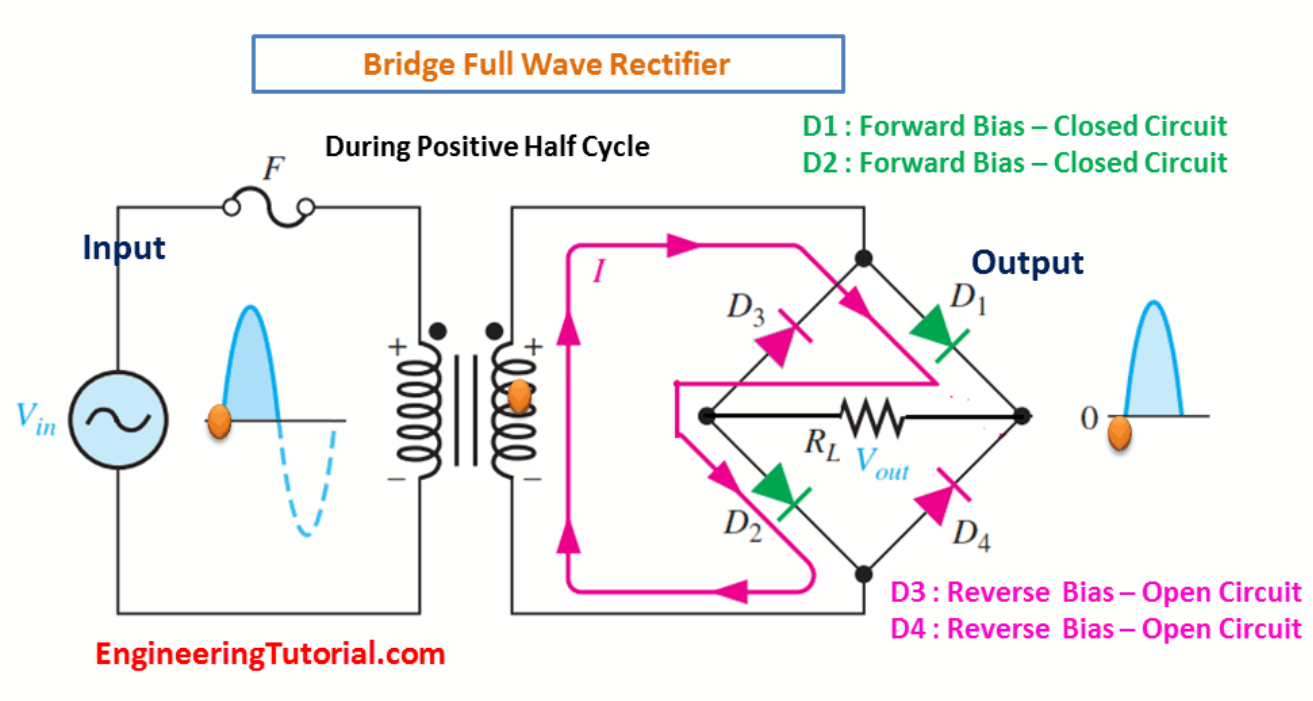
Course Objectives

- Identify and describe operation of semiconductor devices through understanding of the semiconductor physics.
- Develop an understanding of the PN junction diode and its behavior.
- Develop an ability to analyze diode circuits and examine additional applications of the diode.
- Develop an understanding of the Bipolar Junction Transistor (BJT) and its operation.
- Identify and describe the different BJT configurations, DC biasing, and AC analysis.
- Develop an understanding of the Field Effect Transistor (FET) and its operation.
- Identify and describe the different FET configurations, DC biasing, and AC analysis.
- Develop an ability to analyze and design BJT and FET circuits.

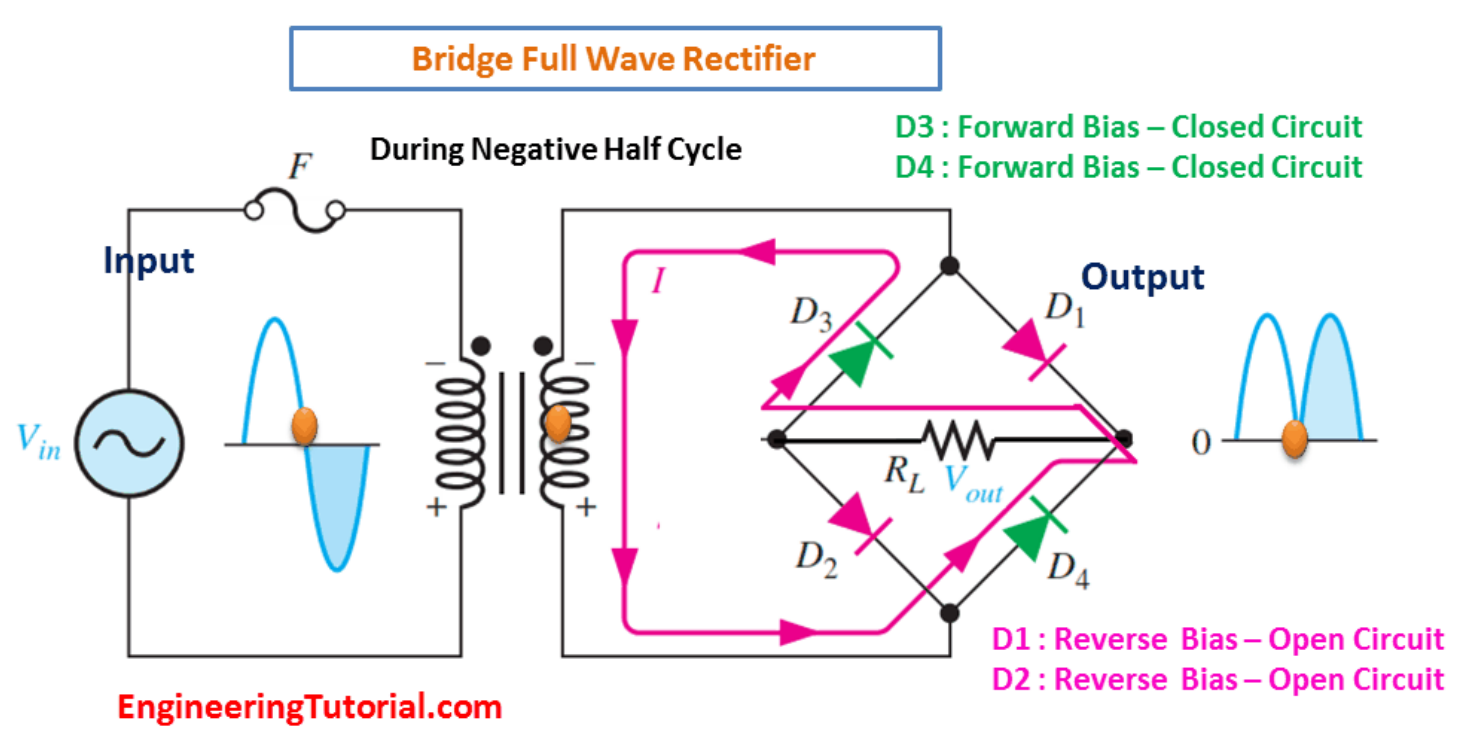
Course Objectives



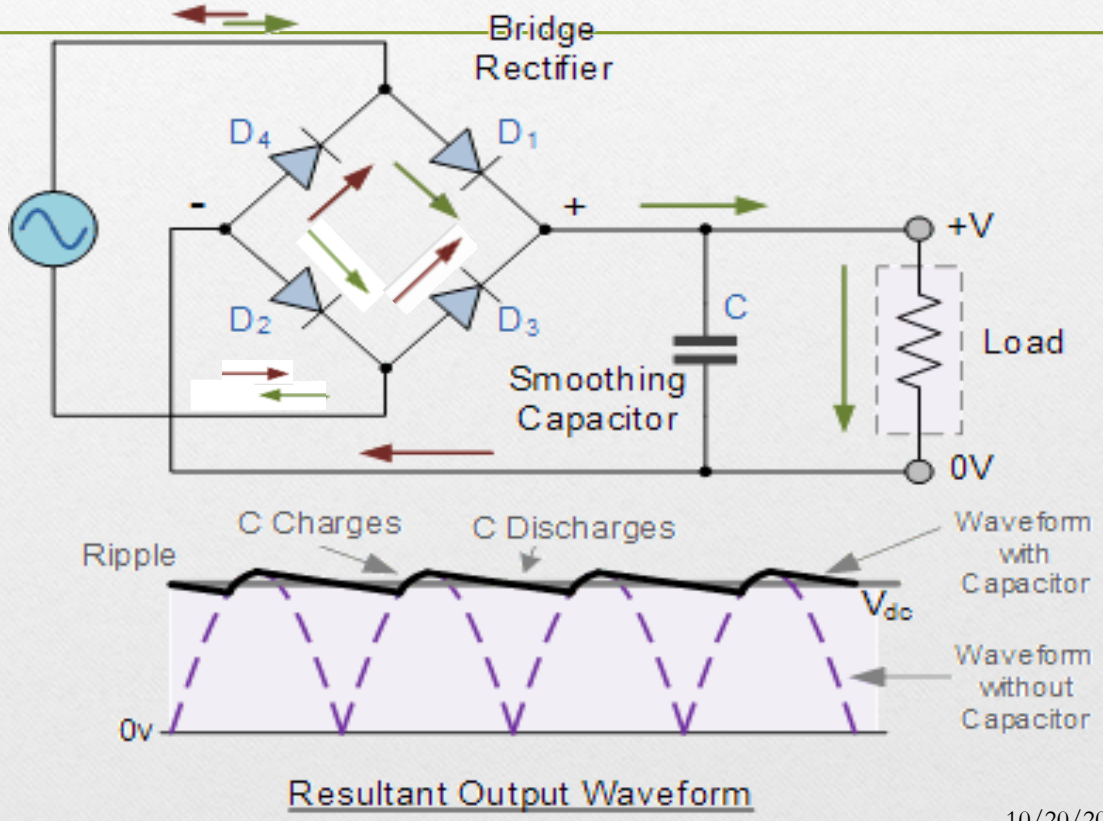
Course Objectives



Course Objectives



Course Objectives



Example of Questions

- State two (2) differences between FET and BJT – LEVEL 1
- Explain how depletion region is created in a pn junction? – LEVEL 2

Example of Questions

- Sketch the output voltage, V_O if the input signal, V_i is a 12 V peak-to-peak square wave – LEVEL 3
- Analyze the circuit below to calculate the base, collector and emitter currents – LEVEL 4

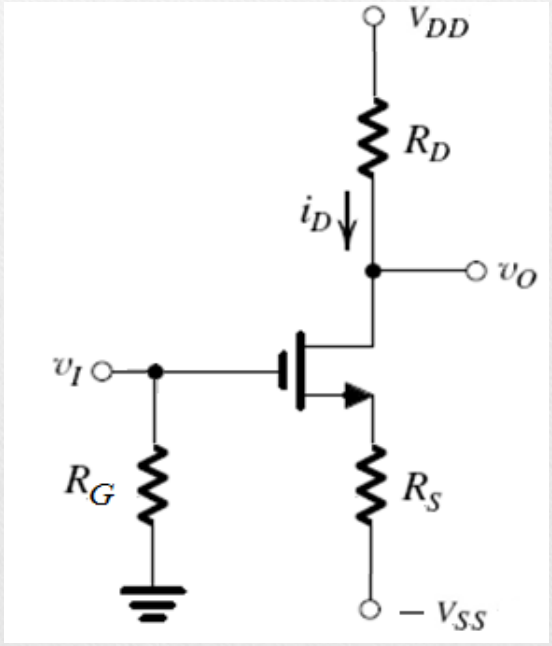
Example of Questions

- Compare the two characteristics for a conventional pn-junction diode and a Zener diode – LEVEL 4/5

- Evaluate the circuit below to determine whether the BJT is in cut-off, active or saturation mode – LEVEL 5

Example of Questions

- Design an n-channel MOSFET circuit is as shown in the figure - LEVEL 6



NOTE:
A DESIGN question generally means that you are required to calculate the values of the resistors.