SUBJECT: EEE 132 Electroni Lecturers: Dr Norlaili Mohd. N Mohd Tafir bin Mustaffa Email: eelaili@eng.usm.my, t	PROGRAM OUTCOMES									MEASUREMENT OF LEARNING OUTCOME						
COURSE DESCRIPTION Diodes and transistors are typical devices in electronic circuits. These devices are made of semiconductor materials. To understand the operation of these devices, basic knowledge of the structure of atoms and the interaction of atomic particles in the semiconductor material are necessary. The p-n junction formed by adjacent p and n semiconductors is the basis of the operation of the diodes and transistors. This course discusses on the current flow across the p-n junction that contributes to the characteristics of the diodes, BJTs and FETs. Consequently, the characteristics of these devices determine the performance of the electronic circuits. The FETs covered in this course are the JFET, D-MOSFET and E-MOSFET. COURSE OBJECTIVES • To give understanding on how current flows through the p-n junction and relating this phenomena to the characteristics and operation of the diodes, bipolar and field-effect transistors. • To expose students to the function and application of the diodes, bipolar junction and field effect transistors in electronic circuits. TEXTBOOK: ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall REFERENCE BOOKS: 1. S.M.Sze. "Semiconductor Devices, Physics and Technology," Second Edition, Wiley, 2002 2. Boylestad and Nashelsky, " Electronic Devices and Circuit Theory," Eighth Edition, Prentice Hall, 2002. GRADING: Test 1 10% Test 2 10% Assignments 10%					apply knowledge of mathematics and science in Electrical and Electronic ing	Ability to use current techniques, skills and engineering tools necessary for solving Electrical and Electronic Engineering problems	to design and develop an Electrical and Electronic Engineering system in fulfilling I needs within practical constraints	Ability to communicate and function in multi-deciplinary environments	Ability to identify, analyse, formulate, and solve Electrical and Electronic Engineering problems both efficiently and economically	Ability to understand and adhere to professional practices and ethical responsibilities	Ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context	Ability to recognise the need and engage in life-long learning	sound knowledge of contemporary issues	Exam	Test/Viva	Assignment/Mini Projects
COURSE OUTCOMES	TEA	CHING CONTENTS		HRS	Ability to app Engineering	bility to	Ability to	bility to	bility to	bility to	bility to	bility to	punos 1	70	20	10
CO1 – Understanding the semiconductor physics of the	1	Revision on Semico	onductor	5	√ W ₩		√ Q	1	√ d	V √	√ V	∀	∀			
intrinsic, p and n materials	2	Intrinsic semicondu	ctors	-	1	√	V	V	V	1	1	1	1			
	3	Extrinsic semicondu	uctors		√	V	V	√	√	√	√	√	√			
	4	Important semicono parameters			V	V	1	V	V	√	√	√	V			
	5	Charge density an semiconductor	d current in		1	1	V	1	V	V	V	V	V			
	6	Fermi-Dirac		-	1	V	1	√	V	√	√	V	V			

	7	Hall Effect		V	V	√	V	V	V		V	V		
	8	Drift and diffusion current		V	V	V	V	V	V	V	V	V	1	
CO2 - Understanding the	9	p-n junction, space-charge	3	V	V	V	V	1	V	V	V	V		
characteristics of the p-n		region and potential barrier												
junction	10	p-n junction biasing		\checkmark	$\sqrt{}$			~						
	11	temperature effects on the p-n						$\sqrt{}$						
	10	junction currents				,		-	,	,	1	,		
	12	current components in p-n junction		√	V	V	√	V	√		√	√		
CO3 - Understanding the	13	diode I-V characteristics	5	1	√	√	1	√	1	1	√	V		
characteristics of the diode	14	diode i-v characteristics	5	\ \sqrt{\sqrt{\sqrt{\colored}}	√ √	V	1		$\sqrt{}$	1	1	N N		
and the diode's application in	15	diode current diode circuits : piecewise linear		$\sqrt{}$	√ √	√ √	1		$\sqrt{}$	V	V	V		
electronic circuits	13	model		,	•	•	'	•	'	\ \ \	\ \ \	'		
	16	rectifying diodes			V	V	V	V	√	V	V	V		
	17	rectifier-filter			V	V	$\sqrt{}$	V	√		V			
	18	clipping and limiting diode circuits		V	V	V	1	V	1	1	1	1		
	19	clamping diodes			V	V	√	V			V			
CO4 - Understanding the characteristics of some special function diodes and the diode's application in electronic circuits	20	zener diode, zener breakdown, avalanche breakdown, temperature coefficient, zener diode application (regulator and limiter)	5	√ 	V	V	V	V	√	√ 	√ 	√ 		
	21	varactor, LED, photo, tunnel, laser, Schottky		V	V	V	1	V	V	1	1	1		
CO5 - Understanding the BJT	22	Introduction to BJTs and FETs – application and advantages of one over the other, differences between BJTs and FETs and JFETs with MOSFETs BJT types, symbols and operation	2	V	V	V	V	V	V	V	V	V		
	23	BJT currents in and parameters	1	V	V	V	V	V	V	$\sqrt{}$	V	1		
	24	BJT configurations	2	√	V	V	√	V	√	√	√	$\sqrt{}$		
	25	BJT modes of operation			V	V	V	√		$\sqrt{}$	V	√ _]	
	26	BJT input and output I-V characteristics		V	√	√		√			V	√ 		
	27	BJT dc biasing – load line and Q-point and biasing circuits	1	V	V	V	V	V	V	V	V	V		

	28	Stability of biasing circuit, BJT as a switch, introduction to the small-signal model (transconductance, input conductance, depletion and diffusion capacitance, Early effect).	2	√ 	V	V	V	V	٧	V	V	V		
CO6 - Understanding the JFET	29	Symbols, types, cross-section, operation, transfer and drain characteristics, important parameters	1	√ 	V	V	V	V	V	V	V	√ 		
	30	JFET current equation JFET dc biasing: Fixed biasing, Self biasing, Mid-point biasing, Voltage division biasing, load line and Q-point, Q-point stability	1	V	V	V	V	V	V	V	V	V		
CO7 - Understanding the D-MOSFET	31	Symbols, cross-section, operation (enhancement, depletion), transfer and drain characteristics, current equation DC biasing : zero bias	1	V	V	V	V	V	V	V	V	V		
CO8 - Understanding the E-MOSFET	32	Symbols, cross-section, operation, transfer and drain characteristics, current equation, channel length modulation effect DC biasing: voltage divider, drain feedback	1	V	√	V	V	V	V	V	V	V		

Chapter No.	Course Outcome	Text
1	Understanding the semiconductor physics of the	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall –
	intrinsic, p and n materials	Chapter 1 S.M.Sze. "Semiconductor Devices, Physics and Technology," Second
		Edition, Wiley, 2002 – Chapters 2 and 3
		Boylestad and Nashelsky , "Electronic Devices and Circuit Theory,"
		Eighth Edition, Prentice Hall, 2002 – Chapter 1
2	Understanding the characteristics of the p-n junction	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall –
		Chapter 1
		S.M.Sze. "Semiconductor Devices, Physics and Technology," Second
		Edition, Wiley, 2002 – Chapter 4 Boylestad and Nashelsky , "Electronic Devices and Circuit Theory,"
		Eighth Edition, Prentice Hall, 2002 – Chapter 1
3	Understanding the characteristics of the diode and the	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall –
	diode's application in electronic circuits	Chapter 2
	and a deprivation in cross of the control of the co	Boylestad and Nashelsky, " Electronic Devices and Circuit Theory,"
		Eighth Edition, Prentice Hall, 2002 – Chapter 2
4	Understanding the characteristics of some special	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall -
	function diodes and the diode's application in electronic	Chapter 3
	circuits	Boylestad and Nashelsky, "Electronic Devices and Circuit Theory,"
	LI L L P II DIT	Eighth Edition, Prentice Hall, 2002 – Chapter 2
5	Understanding the BJT	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall –
		Chapters 4 and 5 S.M.Sze . "Semiconductor Devices, Physics and Technology," Second
		Edition, Wiley, 2002 – Chapter 5
		Boylestad and Nashelsky , "Electronic Devices and Circuit Theory,"
		Eighth Edition, Prentice Hall, 2002 – Chapters 3 and 4
6	Understanding the JFET	ThomasL.Floyd, 'Electronic Devices', Sixth Edition, Prentice Hall –
7	Understanding the D-MOSFET	Chapter 7
8	Understanding the E-MOSFET	S.M.Sze. "Semiconductor Devices, Physics and Technology," Second
		Edition, Wiley, 2002 – Chapter 6
		Boylestad and Nashelsky, "Electronic Devices and Circuit Theory,"
		Eighth Edition, Prentice Hall, 2002 – Chapters 5 and 6