University of Kerala

Discipline	**PHYSICS**				
Course Code	**UK3DSCPHY200**				
Course Title	**BASIC ELECTRONICS**				
Type of Course	**DSC**				
Semester	**III**				
Academic Level	**200 - 299**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites					
Course Summary	This course aims to familiarise the electronic components, their characteristics and applications. It also helps to understand the linear IC 741 and its mathematical operations.				

BOOKS FOR STUDY:

1. Principles of Electronics: V. K. Mehta and Rohit Mehta, S. Chand Ltd.,2020 Edition
2. Basic Electronics-Solid State: B. L. Theraja, S. Chand Ltd. 2005
3. Basic Electronics: Devices, circuits and IT fundamentals: Santiram Kal, PHI, 2010

BOOKS FOR REFERENCE:

1. Electronic Devices and Circuit theory: Robert Boylestad & Louis Nashelski, PHI,5th Edn.
2. Electronic Fundamentals & Applications: John D Ryder, PHI, 4thEdn.
3. Introduction to semiconductor materials and Devices, M.S Tyagi, Wiley India (2005)
4. Electronic circuits; Analysis and Design, Donald Neamen, Mc Graw Hill Education India (Third Edition)

5. Operational Amplifiers and Linear integrated circuits, R. A Gayakwad, Prentice Hall India (Fourth Edition 2015)
6. Digital Principles and Applications, Donald P Leach and Albert Paul Malvino, The Mc Graw Hill Company, Sixth Edition

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I		**Diodes and Transistors (Book 2: Chapter 13, 15, 18 & 19)**	**9**	
	1	P-N Junction Diode - Characteristics, Zener diode, Zener diode as Voltage regulator	2	1
	2	Rectification: Halfwave, Full wave-Centre tap, Bridge rectifiers (Derivations not required), RC Filter circuit, Dual power supply	3	1, 6
	3	BJT-Theory of BJT operation and Configurations	2	1
	4	CB and CE characteristics and Gain parameters	2	2
II		**Transistor Amplifiers (Book 1: Chapter 8, 9, 10 & 11)**	**9**	
	5	Need for biasing and stabilization, stability factor-Thermal Runaway (Basic ideas only)	1	2, 6
	6	Selection of Operating point- ac and dc Load lines	2	2
	7	Collector feedback; base resistor and potential divider methods (CE configuration only)	2	2
	8	BJT amplifiers - analysis of CE amplifier (frequency response, band width, impedance and gain)	2	2, 6
	9	Multi stage Amplifiers- RC and Transformer coupled amplifiers	2	2
III		**Feedback Circuits (Book 2: Chapter 25 & 28)**	**9**	
	10	Feedback principles – Negative feedback - advantages of negative feedback	2	3
	11	Forms of negative feedback (Series and shunt)	1	3
	12	Positive feedback - Barkhausen criterion for oscillations	2	3
	13	Principle of Sinusoidal oscillation	1	3
	14	Hartley Oscillator, Colpitt's Oscillator and RC phase shift oscillator (derivations not required)	3	3,6

IV	**Operational Amplifiers (Book 1: Chapter 25)**		**9**	
	15	Differential amplifier- Common mode and Differential signals	2	4
	16	Voltage gain in Differential amplifiers- CMRR	1	4
	17	Concept of Virtual Ground, Ideal Op Amp and its features- Familiarising IC 741 Op Amp	1	4
	18	Inverting and Non inverting Amplifiers	2	4
	19	Op Amp Applications: Voltage follower, Adder, Subtractor	2	4,6
	20	Op Amp Applications: Integrator-Differentiator	1	4, 6
V*	**Logic Gates and Boolean Algebra (Book 2: Chapter 33 & 34)**		**9**	
	21	Positive and Negative logic- Basic Logic gates (OR, AND and NOT)	2	5, 6
	22	De Morgan's theorem, Bubbled gates, Universal gates and XOR gates	3	5
	23	Laws of Boolean Algebra-Equivalent circuits (Solving simple circuits only)	2	5
	24	Adders and Subtractors	2	5

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		**CO No**
Sl No	**Name of Experiment**	
1	**PN junction Diode (Ge & Si) characteristics**-To draw the characteristic curves of a PN junction diode and to determine its ac and dc forward resistances.	6
2	**Full wave (centre tapped) rectifier**-To construct a full wave rectifier using junction diode and to calculate the ripple factor with and without shunt filter	6
3	**Bridge rectifier**-To construct a bridge rectifier using junction diodes and to calculate the ripple factor with and without shunt filter	6
4	**Zener diode as a voltage regulator**-To construct a voltage regulator using Zener diode and to study its line regulation and load regulation.	6

5	**Transistor CE characteristics**-To draw the characteristic curves of a transistor in the CE configuration and determine the current gain, input impedance and output impedance	6
6	**OP amp. IC741- Inverting amplifier**-To construct an inverting amplifier using IC741 and determine its voltage gain	6
7	**OP amp. IC741- Non-inverting amplifier -** To construct a non-inverting amplifier using IC741 and determine its voltage gain	6
8	**Logic Gates** (AND, OR and NOT) using Diodes and Transistor	6
Part B* – At least One Experiment to be performed		
9	**Dual power supply**-To construct a dual power supply using bridge rectifier and measure the output voltages for different pair of identical load resistors	6
10	**Single stage CE amplifier**- To construct a single stage CE transistor amplifier and study its frequency response (designing not required).	6
11	**RC Phase shift oscillator (**using transistor**)**	6

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Familiarize solid-state devices for rectification	U, R, Ap	1
CO-2	Understand different amplifier circuits	U, Ap	1
CO-3	Understand positive and negative feedback circuits	U	1
CO-4	Understand the concept and applications of operational amplifiers.	U, Ap	1
CO-5	Familiarise digital electronics principles	U, R	1
CO-6	Fabrication of elementary electronic circuits	Ap	3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: BASIC ELECTRONICS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Familiarize solid-state devices for rectification	PO1/ PSO1	U, R, Ap	F, C	L	-
CO-2	Understand different amplifier circuits	PO1/ PSO1	U, Ap	C	L	-
CO-3	Understand positive and negative feedback circuits	PO1/ PSO1	U	C	L	-
CO-4	Understand the concept and applications of operational amplifiers.	PO 1/ PSO1	U, Ap	F, C	L	-
CO-5	Familiarise digital electronics principles	PO 1/ PSO 1	U, R	F, C	L	-
CO-6	Fabrication of elementary electronic circuits	PO 1/ PSO 3	Ap	P	-	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO-1	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-2	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-3	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO-4	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-

CO-5	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-6	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Levels:

Level	**-**	**1**	**2**	**3**
Correlation	**Nil**	**Slightly / Low**	**Moderate / Medium**	**Substantial / High**

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	✓	✓
CO-3	✓	-	-	✓
CO-4	✓	-	-	✓
CO-5	✓	-	-	-
CO-6	✓	-	-	✓