PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				23PHMAL233			
Title of the Course				**ELECTRONIC DEVICES AND CIRCUITS**			
Offered to				**B. Sc Hons Physics**			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	**MAJOR**			**Course Relates to:**	**GLOBAL**		
Year of Revision:	**NA**			**Percentage:**	**NA**		
Type of the Course:				**EMPLOYABILITY**			
Crosscutting Issues of the Course:				**NA**			
Pre-requisites, if any				**Basic Knowledge**			

Course description:

The course on Electronic Devices and Circuits aims to provide students with a fundamental understanding of electronic devices and their applications in various circuits.

S.No	COURSE OBJECTIVES
1	To introduce semiconductor devices P.N. Junction Diode, Zener Diode and Tunnel their and their characteristics, operations, circuits and applications.
2	To introduce operation of PNP and NPN Transistors and various modes of operations, characteristics, relations and their Hybrid parameters.
3	To analyse and interpret FET and MOSFET circuits for small signal at low and high Frequencies
4	To study the characteristics of different Photo electric devices
5	To study the different types of Rectifiers & filters

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Understand the behaviour of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics, Zener Diode, Tunnel Diode.	**K2**	**PO1**	**PSO1**
CO2	Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.	**K4**	**PO2**	**PSO2**

CO3	Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJTs.	K5	PO2	PSO1
CO4	Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.	K 3	PO1	PSO2
CO5	Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators	K 2	PO2	PSO2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	**2**							**2**	
CO2		**3**							**3**
CO3		**3**						**3**	
CO4	**2**								**2**
CO5		**2**							**2**

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

Unit	Learning Units	Lecture Hours
I	**PN JUNCTION DIODES** P-N junction Diode, Formation of the depletion region, Forward and Reverse bias - Reverse saturation current, Zener diode - V-I characteristics, Zener diode as Voltage Regulator, Tunnel Diode - working, V-I characteristics, Advantages and Disadvantages of P-N, Zener & Tunnel diodes.	12
II	**TRANSISTOR AND ITS BIASING: (D.C)** Transistor construction, working of PNP and NPN Transistors, Active, Cutoff, and Saturation conditions, Configurations of Transistor - CB, CE, and CC, Input and Output Characteristics of CE configurations. Relation between α, β and γ relation, Hybrid parameters of a Transistor and equivalent circuit,	12
III	**TRANSISTORS & POWER ELECTRONIC DEVICES** BJT Transistor Biasing - Need for biasing, BJT biasing- methods, basic stability, fixed bias, collector-to-base bias, self-bias, Stabilization against variations in V_{BE}, I_c, and β, Stability factors, (S, S', S''), Bias	12

	compensation, Thermal runaway, Thermal stability. FET - Construction, Working, drain and transfer characteristics. MOSFET-enhancement, depletion MOSFET, construction and working, Characteristics of MOSFET, applications of MOSFET.	
IV	**PHOTO ELECTRIC DEVICES:** Light-emitting diodes (LEDs) - Construction, working, characteristics and Applications, Photodiode - Construction, working characteristics and Applications, Phototransistors - Construction, working and characteristics, Applications, LDR - Structure and operation, Applications	12
V	**POWER SUPPLIES:** Rectifiers: Half wave, full wave, bridge rectifier, derivations of characteristics of rectifiers. Filters -Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π Filter, comparison of various filter circuits in terms of ripple factors.	12

Activity: Unit-I

PN JUNCTION DIODES

Assignment:

1. Explain the construction and working and V-I characteristics of a PN Junction diode
2. Discuss the working of a Tunnel diode. Explain its V-I characteristics.
3. What are the advantages and disadvantages of PN Junction Diode
4. Problems

Activity: Unit-II

TRANSISTOR AND ITS BIASING:

Assignment:

1. Explain the input and output characteristics of CE Transistor configuration
2. Describe the construction & working of an NPN Transistors. Explain its Active, Cut-off and Saturation conditions.
3. Write a short on Hybrid parameters of a Transistor.
4. Problems

Activity: Unit-III

TRANSISTORS & POWER ELECTRONIC DEVICES

Assignment:

1. Explain collector-to-base biasing of Transistor.
2. Explain the construction, working drain and transfer characteristics of a FET
3. Write any five applications of MOSFET.
4. Problems.

Activity: Unit-IV

PHOTO ELECTRIC DEVICES:

Assignment:

1. Write a short note on structure and operation of Phototransistor.
1. 2 Discuss the construction, working & characteristics of a Light-emitting diodes.
2. Mention any four applications of Photodiode.
3. 4.Problems

Activity: Unit-V

POWER SUPPLIES:

Assignment:

1. Explain the construction and working of a Half wave rectifier.
2. Explain the construction & working of an inductor and II filter.
3. Explain the working of capacitor filter.
4. Problems

Text BOOKS:

1. Unified Physics Electronic Devices & Circuits, Jai Prakash Nath & Co. Ltd., Meerut.

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.

2. Electronic Devices and Circuits I – T.L. Floyd- PHI Fifth Edition

3. Integrated Electronics – Millmam & Halkias.

4. Electronic Devices & Circuits – Bogart. Sedha R.S.,

5. A Text Book Of Applied Electronics, S.Chand & Company Ltd

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SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	**23PHMAL233 ELECTRONIC DEVICES AND CIRCUITS**
Offered to:	**II B.Sc. H PHYSICS**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

Q1 (a) Show that Zener diode can work as a voltage regulator (CO1, K3)

OR

(b) What do you mean by hybrid parameters of a transistor (CO2, K3)

Q2 (a) Explain the working of capacitor filter. (CO5, K2)

OR

(b) Describe any four applications of Photodiode. (CO4, K2)

Q3 (a) Outline the collector-to-base biasing of Transistor. (CO2, K1)

OR

(b) Explain the construction of MOSFET. (CO3, K1)

Q4 (a) The constant α of a transistor is 0.9. What would be the change in the collector current corresponding to a change of 4 mA in the base current in a common emitter arrangement. (CO1,K3)

OR

(b) The pinch-down voltage of a P-channel junction FET is V_p = 5V and the drain to source saturation current I_{DSS} = - 40 mA. The value of drain source voltage V_{DS} is such that it is opened in saturation region. The drain current is given by I_D = - 15 mA. Determine $V_{GS.}$ (CO1, K3)

Q5 (a) A full wave rectifier with a load resistance of 5 k Ohm uses an inductor filter of 5 henry. The peak value of the applied voltage is 250V and frequency is 50 cycles/second. Calculate the DC load current. (CO1, K3)

OR

(b) In CB configuration, the value of α = 0.98 A. A voltage drop of 4.9 V is obtained across a resistance of 5 k ohm when connected in collector circuit. Fine the base current. (CO1,K3)

Section B

Answer All questions. Each question carries 10 Marks.

Q6 (a)Explain the construction and working and V-I characteristics of a PN Junction Diode (CO1, K2)

OR

(b) Discuss the working of a Tunnel diode. Explain its V-I characteristics. (CO1, K2)

Q7 (a) Describe the construction & working of a NPN Transistors. Explain its Active, Cut-off and Saturation conditions. (CO2, K2)

OR

(b)Explain the terms $\alpha, \beta \; and \; \gamma$ terms of a transistor and obtain the relation between them (CO2, K2)

Q8 (a) Outline the construction, working, drain and transfer characteristics of a FET. (CO1,K4)

OR

(b)Examine about the need for biasing in BJT. Explain various methods of Biasing. (CO1, K4)

Q9 (a) Discuss the construction, working & characteristics of a Light-emitting diodes. (CO1, K2)

OR

(b) Explain the construction, working & characteristics of a photo transistor. (CO1, K2)

Q10 (a)Design a circuit diagram & explain the construction & working of a bridge Rectifier. (CO5, K6)

OR

(b) Construction an inductor and II filter. Explain its working (CO5, K6)

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