

B.Sc.
Third Year



Sem VI
Elective

Physics

(Basic Electronics)



Telugu Akademi
Hyderabad

B.Sc.
Third Year
PHYSICS
(Semester - VI)
Basic Electronics
(Elective)

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Telugu Akademi
Hyderabad

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Foreword

The role played by the Telugu Akademi in stabilizing Telugu Medium at the level of Higher Education since its inception (1968) is well known. The Akademi has rendered needful services to the student community at higher education level by publishing a number of Text books for Intermediate, Degree and PG. Reference books, Translations, Popular series, Monographs, Dictionaries, Glossaries, Readings and Question Banks for EAMCET over the years. Many of these books were reprinted a number of times as per the demand.

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This book titled **Physics (Basic Electronics)** is prescribed by the **Telangana State Council of Higher Education** for the Students of B.Sc. Third Year, Sixth semester as one of the elective paper for the academic year 2018-19. We thank all the eminent professors and senior teachers who are involved in the preparation of this book. This is done in strict adherence to the syllabus.

We appreciate constructive suggestions for the improvement of this text book.

Director
Telugu Akademi

Preface

Telangana State Council of Higher Education (TSCHE) had directed the state universities in consultation with the Higher Education department, Government of Telangana to implement the Choice Base Credit System (CBCS) following the guidelines of model curriculum issued the University Grants Commission (UGC). This system provides an opportunity for students to choose core, elective or skill-based courses. Consequently, Telugu Akademi has invited the subject experts to write a Text Book entitled '**Basic Electronics**' as an elective for Physics subject for VI semester of B.Sc degree and published this book as an outcome with the sincere efforts put by the authors.

The objective of this book is to impart a comprehensive knowledge in the operation principles of solid state devices, their basic circuits and applications in electronic systems so that it can serve as a text for the universities and colleges. In this book, subject content is developed in a conceptual approach following the mainstream of the basic electronics progressively, which enables the students to gain the knowledge effectively. The chapters are made very simple and easily understandable for an average student. Definitions of physical phenomenon and derivations of the expressions are written lucidly. Paramount care is taken while presenting each topic to make complex theory to be simpler. The prescribed syllabus is spread across eight chapters in four units. Worked out examples, problems, objective type questions, short and long answer type questions are given at the end of each chapter for a better insight into the concepts. This practice will help the student in complete coverage of the topics in the syllabus.

Unit I is divided into two chapters, of which one chapter deals with the topics passive and active elements, power sources, network models and their transformations, and network theorems. The other chapter covers Two-port networks and their associated parameters like Z-, Y-, h- and ABCD parameters.

Unit II deals with two chapters. First chapter Band theory – PN junction is presented with the topics band theory, classification of materials and types of semiconductors. Second chapter covers the diodes, in which the PN-junction

characteristics and its applications as half-wave, full-wave and bridge rectifiers; Zener diode characteristics and its application as voltage regulator are dealt.

Unit III covers two chapters as Bipolar Junction Transistor and Feedback concepts & oscillators. First chapter presents the basics of transistor, types of transistors, current components, types of transistor configurations and their characteristics, transistor as an amplifier and frequency response of transistor R-C coupled amplifier. Second chapter covers the general theory of feedback, conditions for oscillations and the working of phase-shift oscillator.

Unit IV also covers two chapters as Digital Electronics and Logic Gates. Various number systems like binary, decimal and hexa-decimal number systems and their conversion; binary addition and subtraction using 1's and 2's complement are dealt in Digital Electronics chapter, whereas the Logic gates chapter deals with basic gates OR, AND and NOT and their implementation using discrete components, truth-tables, universal gates NOR and NAND and their realization, De-Morgan theorems and their proofs; and simplification of Boolean expressions.

Sincere attempts have been made to present the various physical concepts as clearly as possible.

Though, the utmost care has been taken to avoid mistakes and inconsistencies, some human and typographical errors might have crept in unintentionally. If any such mistakes have taken place, constructive suggestions are highly appreciated and greatly acknowledged if they are brought to the notice of Telugu Akademi for the improvement of the book in the subsequent editions.

- Editor

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S. Vedavyas
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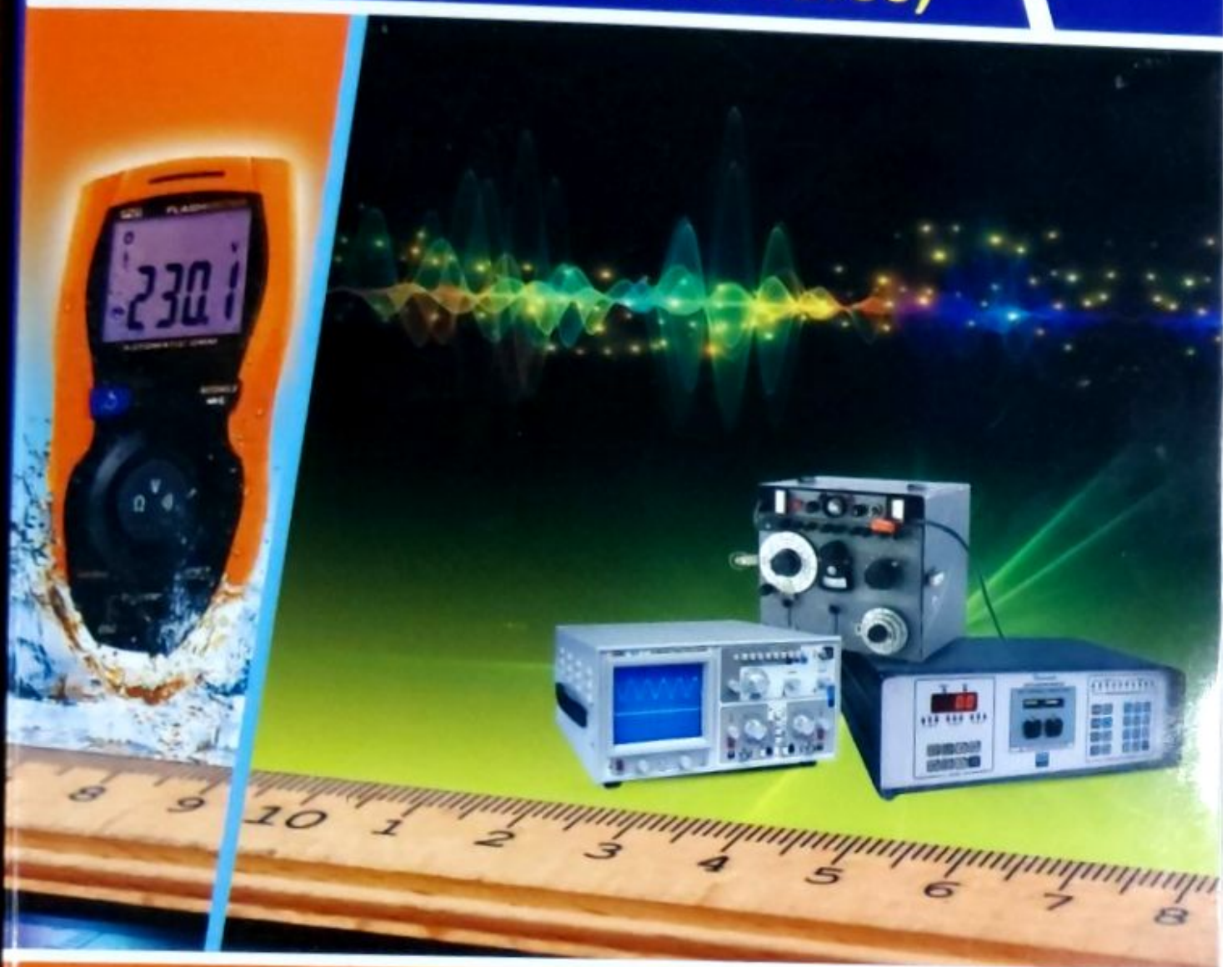
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B.Sc.

Physics



Basic Instrumentation
(Skill Enhancement Course)



Telugu Akademi
Hyderabad

B.Sc.
Physics
Basic Instrumentation
(Skill Enhancement Course)

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(Physics of Semiconductor Devices)



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Hyderabad**

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(Semester - VI)
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(Elective)

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Foreword

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We appreciate constructive suggestions for the improvement of this text book.

Director

Telugu Akademi

Preface

The book 'Physics of Semiconductor Devices' is an elective for Physics subject in VI semester of B.Sc degree and may be used as a text for undergraduate students in Physics, Applied Physics and Electronics. This book introduces the physical principles of semiconductor devices and their fabrication.

The aim of this book is to provide an inclusive knowledge in the principles of operation of semiconductor devices, their basic circuits and applications. Attempts have been made to present the physical concepts as clearly as possible. The subject content in this book is built up in a conceptual manner for easy understanding of the basic electronics, which makes the students to acquire knowledge effectively.

The prescribed syllabus of the elective of VI semester Physics is spread across four units. Each unit covers the prescribed topic followed by short answer questions, essay questions and objective type questions at the end. Worked out problems are also given at the end of each unit to demonstrate the applicability of theory.

Unit I covers the Semiconductor Physics which introduces the basic knowledge on the relationship between the electrons and other constituents of an atom. The knowledge about the differences among conductors, insulators and semiconductors can be acquired and thereby getting understanding of p-type and n-type semiconductor materials. The nature of semiconductors, effect of impurities on their conduction will be studied in this unit.

Unit 2 deals with P-N junction and characteristics, from which the formation of junction between p-type and n-type semiconductors, band structure, biasing and effect of barrier potential on p-n junction can be known. This unit also covers the topics on breakdown of p-n junction, breakdown mechanisms, diode models, diode approximations and diode resistance.

Unit 3 deals with doping levels, formation of junction and biasing conditions in semiconductor devices. It also deals with construction and working of various semiconductor devices such as diodes namely Zener diode, tunnel diode, light emitting diode, photo diode, Schottky diode, etc., and three layer semiconductor devices like bipolar junction transistor (BJT) and field effect transistor (FET). The devices, which work on combination of optics and electronics laws known as photo electric devices, are also dealt in this unit.

Unit 4 emphasizes the applications of semiconductor devices as controlled devices, which include Thyristors, Shockley diode (PNPN diode), Silicon controlled rectifier (SCR), Unijunction transistor (UJT) and Silicon controlled switch (SCS).

In spite of having taken care to evade mistakes and discrepancies, some human and typographical errors might have taken place inadvertently. Constructive suggestions are highly appreciated and greatly acknowledged for the improvement of the quality of the book in the subsequent editions.

- Editor

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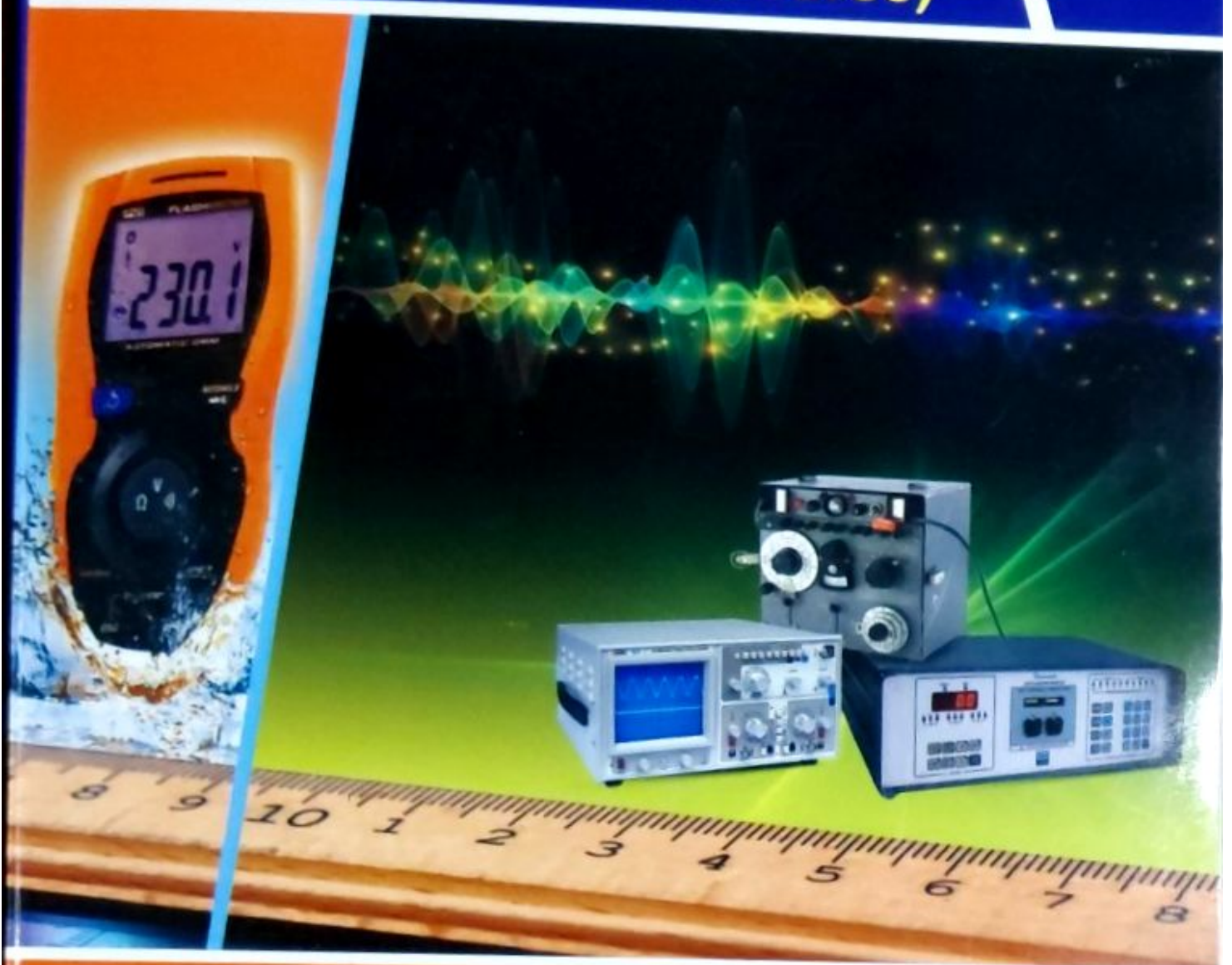
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B.Sc.

Physics



Basic Instrumentation
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