ENGINEERING ELECTRONICS

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PREFACE

The authors present herewith a textbook for use in a beginning course in electronics for electrical-engineering students. Most of the material used was first published in planograph form and has been used as a text at Purdue University for the past two years. It has been revised and brought up to date as use in the classroom and the advice of critics have indicated that improvements could be made.

The usual course in technical schools consists of two or three class periods and one laboratory period each week throughout the school year. Sufficient material is included for such a program. It has been the authors' experience that the average student enrolling in such a course has the following status: He is a junior and has already had courses in general physics, mathematics through calculus, and direct-current circuits. He is starting courses in alternating-current circuits, electrical measurements, and possibly differential equations, as well as electronics. The student plans to enter one of various fields—communications, electronic control, servomechanisms, power machinery, power transmission, business, graduate study. What he will actually do after graduation is often something else. In any event electronics will be useful knowledge for one engaged in nearly any branch of electrical engineering and in many allied fields. The material in this book presents the fundamental ideas of electronics in both a theoretical and a practical fashion to provide a good foundation for further study, as well as useful knowledge for a terminal course.

The first four chapters provide material for a brief study of the physics of vacuum tubes, not covered in the usual previous physics courses. They also serve to delay the study of circuits until the student has gained some knowledge of a-c circuits elsewhere. Chapter 5 presents a very elementary description of the circuits and actions of certain very common electronic devices. It also acquaints the student with some common electronic nomenclature. The authors have found it fills a very real need —to provide a background for those students who have not picked it up in their experience. Even with very rapid coverage it should be valuable.

Chapter 6 presents the usual methods employed in electronic-circuit analyses, analytic and graphical. Great stress is laid on the use of the linear-equivalent-circuit theorem. Also considerable attention is paid to graphical methods with nonlinear circuits. Only elementary aspects of

this fascinating subject are presented because of the limitations of time and space.

Although in theory a student should have well in hand all the tools he has studied, as a practical matter the authors feel that a brief restatement or treatment of certain ideas often helps enough to pay for its inclusion in a volume designed principally as a textbook. Hence the short treatments of such subjects as network theorems and Fourier analysis are included. The practical use of this material begins at once in the following chapter, although for some of it the delay is great enough, as in the case of power-series expansion of plate current, so that the student will wish to refer back to the discussion again. At any rate he knows where to find the material.

The chapters following the sixth present a selection of the various aspects of electronics which can reasonably be included in a beginning course. No claim is made that all the interesting and useful developments in the field are discussed or even mentioned.

In the numerous cases in which a mathematical development is attempted, the authors have endeavored to provide, first, a facile word explanation for the behavior. Then follows the sensing of current and voltage symbols, the writing of circuit equations, the solution of these, the simplifying assumptions and rearrangement needed to place the solution in a usable form (which often involves the drawing of a simplified equivalent circuit), and the final interpretation of the results. Numerous worked-out examples are provided to help in understanding. The authors feel that much practice is needed in these matters for students who plan to continue in fields allied to electronics.

The authors have freely consulted periodicals and engineering texts by many writers. They wish to acknowledge the valuable criticism and encouragement given by their colleagues. Especially do they appreciate the assistance of their former colleague, Dr. K. J. Hammerle. In addition, thanks are due the unknown critics engaged by the publisher. They have made many valuable suggestions.

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Electronics engineering is a professional engineering discipline that deals with the emission, behavior, and effects of electrons (as in electron tubes and transistors) and with electronic devices, systems or equipment. The term also now covers the larger part of electrical engineering degree courses as studied at most European universities. Its practitioners are called electronics engineers in Europe. In the Americas the term electrical engineer is used to describe the same work. Electronic engineering, or electronics engineering is a form of engineering associated with electronic circuits, devices and the equipment and systems that use them. Electronic engineering utilises a variety of different types of electronic components from the more traditional analogue components through to digital electronic components, microprocessors and microcontrollers as well as programmable logic devices. This means that electronic engineering can incorporate a large variety of different areas. Typical electronic engineering undergraduate syllabus. Apart from electromagnetics and network theory, other items in the syllabus are particular to "electronics" engineering course. "Electrical" engineering courses have other specialisms such as machines, power generation and distribution. Note that the following list does not include the large quantity of mathematics (maybe apart from the final year) included in each year's study.