Sixth Edition

Engineering Economy

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E8064456

Macmillan Publishing Co., Inc.
NEW YORK

Collier Macmillan Publishers
LONDON

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Printed in the United States of America

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Earlier editions entitled *Introduction to Engineering Economy*, by E. P. DeGarmo and B. M. Woods, copyright 1942 and 1953 by Macmillan Publishing Co., Inc. Earlier editions entitled *Engineering Economy* © 1960 and copyright © 1967 and 1973 by Macmillan Publishing Co., Inc.

Macmillan Publishing Co., Inc.
866 Third Avenue, New York, New York 10022

Collier Macmillan Canada, Ltd.

Library of Congress Cataloging in Publication Data

DeGarmo, Ernest Paul,
Engineering economy.

Bibliography: p.
Includes index.
1. Engineering economy. I. Canada, John R., joint author. II. Sullivan, William G., joint author.
III. Title.
TA177.4.D43 1979 658.1'596 78-2265
ISBN 0-02-328160-X

Printing: 2 3 4 5 6 7 8 Year: 0 1 2 3 4 5

engineering economy

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preface

This textbook and basic reference is intended primarily for engineering students who are studying their first formal course in engineering economy. It is also useful for students in business-related curricula concerned with economic analysis of alternatives by widely used nonmathematically sophisticated methods. It assumes that the students have had little formal exposure to economics, accounting, and statistics and have a very limited knowledge of the common financial practices of business.

Inasmuch as all aspects of the field of engineering economy cannot be covered in depth in a one-quarter or one-semester first course, the book is not intended to impress the professionals in the field. Rather, it is written from the viewpoint and needs of the students who will use it. Its purpose is to give them a sound understanding of the basic aspects of the subject and some insight into approaches that can be used for making sound economic decisions concerning the types of problems they are likely to encounter in other engineering courses and in their careers. At the same time they should acquire a solid base for further study after graduation, which will permit them to understand and use more advanced, and constantly developing, procedures needed or helpful in analyzing the more complex economic problems that they may encounter in their later careers.

Although the book undoubtedly will be used by those other than college students, we ask their pardon for placing them second to students in organizing the contents. As in previous editions, no single economy study method or pattern is advocated. Instead, several methods are presented and used in the belief that different procedures can be used advantageously in various situations, provided the analyst understands the basic principles involved.

That costs and the economic use of capital remain a major concern to engineers was reemphasized by a survey of chief engineers and vice presidents in engineering of 85 companies in the United States. When queried as to whether their young engineers, during their first five years after graduation, were required to make economy studies of proposed projects, over 97% replied "yes" and 80% added "frequently." Seventy-five percent believed that engineering economy

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should be a required subject in all undergraduate engineering curricula. Companies engaged in space and defense work expressed the same views in only slightly lower percentages but often more emphatically.

To some extent the subject matter included in this edition has been influenced by the results of the above-mentioned survey. There was rather general agreement that capital budgeting, interest and money timing, decisions among alternatives, depreciation, financing, breakeven analyses, replacement analysis, and effects of risk and uncertainty should be included in a basic course in engineering economy. The table of contents makes it evident that other subjects also have been included. Over half of the numerous problem exercises at the end of each chapter are completely new, and virtually all of the remaining exercises are different from those in the previous edition.

The sequence of chapters in this edition differs somewhat from the fifth edition. This edition is divided into three sections as follows: Part I, "Background and Tools for Engineering Economic Analysis," which contains four chapters, ending with "Interest and Money–Time Relationships"; Part II, "Applications of Engineering Economic Analysis," contains ten chapters in approximately the same order of progression as found in most texts in this field, including separate chapters on "Economy Studies for Public Projects" and "Economy Studies for Public Utilities"; Part III, "Other Useful Methods for Minimizing Resource Requirements" contains four succinct chapters to acquaint the student with such methods as "Value Engineering," "Linear Programming," and "Critical Path Economy."

As a guide to instructors or students engaging in self-study, the sequencing of chapters is intended to follow a logical pattern. With the following exceptions, the chapters should be used sequentially. Chapters 2 and 3 can be made optional according to the emphasis desired. Chapters 15 through 18 are mutually independent and can be made optional. Finally, Chapters 12 and 13 may be omitted by persons not interested in economy studies for public agencies and utilities. Because students will recognize a number of situations where computers can be used advantageously in solving problems, a simple computer program for solving internal rate of return problems is included in Appendix C.

The presentation assumes some facility with linear algebra, but differential calculus is needed in several limited sections. Some understanding of elementary probability is needed for a small section of Chapter 6, and a speaking acquaintance with linear programming concepts is useful for Chapter 17. Adequate references are given for these topics.

For the many suggestions from colleagues, students, and practicing engineers who have used the previous editions, we express our deep appreciation. We hope they will find this volume to be equally helpful. Special acknowledgment and thanks are due Mrs. Martha Jackson, *secretary extraordinaire*, for again rescuing the manuscript from various forms of unintelligibility with great ability.

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part I

Background and Tools for Engineering Economic Analysis

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