Massachusetts Institute of Technology
Center for Advanced Engineering Study

MIT Video Course

Video Course Manual

Electronic Feedback Systems

James K. Roberge Professor of Electrical Engineering, MIT

Reorder No. 74-2100

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Preface

Feedback control is an important technique that is used in many modern electronic and electromechanical systems. The successful inclusion of this technique improves performance, reliability, and cost effectiveness of many designs.

Many of us have had an introductory feedback control subject during our student days. In most cases this introduction was a typically academic one with little emphasis on how theoretical concepts could be applied to actual physical hardware.

In this series of lectures we reintroduce the analytical concepts that underlie classical feedback system design. The application of these concepts is illustrated by a variety of experiments and demonstration systems. The diversity of the demonstration systems reinforces the value of the analytic methods previously introduced and provides the motivation for future lectures.

The lectures incorporate the material in this area that I have found to be most important in my own research and consulting experience. In fact, most of the demonstration systems are closely related to actual systems that I have designed. The lectures also reflect the important comments made by many of the students who have taken a similar subject at MIT.

Each lesson consists of a taped lecture, a reading assignment in the text, and problems, generally also in the text. The suggested sequence is to first view the lecture, then read the suggested sections of the text, and finally solve the problems.

In many cases, the material in the text is more detailed than that provided in the taped lectures. The material learned from the lectures should expedite the self-study of the extensions and amplifications of the text.

It is vitally important that participants in this course solve the problems that are included in the assignments. Simply viewing the tapes, even when combined with the suggested reading assignments, provides a superficial knowledge of the subject matter at best. True mastery requires the in-depth exposure that only comes from wrestling with the concepts through problem solving.

The problem solutions presented in this manual should be consulted only after diligent effort has been made by the participant. We intend the solutions to illustrate what we feel is a good way to solve the problems, rather than to serve as a crutch. Similarly, discussion of the problems with fellow course participants, after having solved them individually, will improve your understanding of the material.

The text frequently includes problems related to the material presented in a lecture that are not specifically assigned. In view of the importance of the first-hand experience gained by problem solving, participants should also solve these additional problems as their schedules permit.

I'd like to thank two of my students for their contributions to the video tapes and the manual. Mike Johnson set up all of the experiments and demonstrations in the studio. He was responsible for the real time magic that replaced one demonstration with another as I lectured away from the demonstration area. Dave Trumper provided all of the problem solutions presented in this manual. The explanations and insights he provides reflect his own excellent understanding of the material.

Most of the viewgraphs used to illustrate the lectures were copied from figures in the text. John Wiley & Sons kindly allowed us to use this material.

Finally, I'd like to thank the many staff members of the MIT Center for Advanced Engineering Study who made the production of the tapes, the manual, and the promotional material possible. Their tolerance of my procrastination was also much appreciated!

James K. Roberge
Lexington, Massachusetts
January, 1986

Lectures

RES.6-010 Electronic Feedback Systems

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