

# PREFACE

Cam-follower systems are an extremely important and ubiquitous component in all kinds of machinery. It is difficult to find examples of machinery that do not use one or more cams in their design. Cams are the first choice of many designers for motion control where high precision, repeatability, and long life are required. All automotive engines depend on cams for their proper valve function. Most automated production machinery uses cams extensively.

The design and manufacture of cams has changed dramatically in recent years. The development and proliferation of computers in engineering design and of numerical control in manufacturing have completely changed the process of cam design and manufacturing, and very much for the better. Until about the late 1960s cams were designed only by manual graphical layout techniques, manufactured in low quantities by manually controlled machining methods and in high quantities by analog duplication of a hand-dressed master cam. The subtleties of the effects of higher derivatives of the cam's chosen mathematical function were often ignored, due either to ignorance of their importance, or the inability to accurately determine their effects given the lack of computational facilities available at the time.

Currently, it is virtually universal and also very economical to use computer-aided engineering and design techniques to create cam geometry, including proper consideration of the effects of higher derivatives, and also to make the cam with high precision using continuous numerically controlled milling, grinding, or electrical discharge machining (EDM) equipment. A significant number of fundamental research results on the subject of cam design and manufacture have been published in recent years. This book is intended to provide a definitive reference for the design and manufacturing of cam-follower systems by bringing up-to-date cam design technology and cam research together between a single set of covers for the benefit of the design and manufacturing engineering community.

The book is a primer on the subject as described in the Foreword. It provides an introduction to the subject to properly design cam-follower systems. Beginning with a description of "how not to design a cam" in order to point out pitfalls that may not be obvious to the beginner, the proper way to design a cam for multiple and single-dwell situations is developed in detail. All the acceptable (and some unacceptable) classical cam functions are described and their mathematics defined for the common double-dwell application. Polynomial functions are introduced and used for both double- and single-dwell examples. Problems with polynomial cams are defined in detail and ways to design around these problems are discussed. The issues of cam pressure angle and radius of curvature are fully addressed for various types of cams and followers: radial, barrel, globoidal, translating, and oscillating, roller and flat-faced.

Every effort has been made to ensure that the material in this book is technically correct. If errors remain, the author takes full responsibility, and will greatly appreciate their being pointed out to him. Please send an email to [norton@wpi.edu](mailto:norton@wpi.edu).

Robert L. Norton  
Mattapoisett, Mass.  
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To get your free copy of the cam design program, *Dynacam Student Edition*, go to <http://www.designofmachinery.com> and click on *Users of Cam Design—A Primer* and provide the required information to obtain a password to download the program.