

Theory of Machines

Kinematics and Dynamics

B.V.R. GUPTA



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Dedication

I dedicate this book on **THEORY OF MACHINES** to my beloved brother.



Sri B.P. Gupta

He is responsible for what I am today. He wrote books on mathematics for engineering students in late fifties when I was very young. His motivation and encouragement helped me in all my endeavours including writing books. I present this book and my previous book on **ENGINEERING DRAWING** to my beloved student community of past, present and future.

Preface

Theory of machines is an important subject not only to mechanical engineering discipline, but also to other engineering disciplines. All products whether they are mechanical, electrical, civil, computers or electronics, are designed, manufactured and maintained by mechanicals only. This is one of the interesting and useful subject which deals with the mechanisms and machines. The book covers both kinematics and dynamics of machines. The book will be useful not only to degree level students of mechanical engineering but also to those preparing for AMIE and various other competitive examinations.

Chapter 1 introduces the concepts of mechanisms and machines. In Chapter 2 various mechanisms consisting of lower pairs are discussed. Chapter 3 deals with the analysis of their motions such as velocities and accelerations of various mechanisms using different methods. Chapter 4 deals with the study of kinetics, the time-varying forces in machines such as torque and power. Chapter 5 gives turning moment diagram and design of flywheels. Chapter 6 gives about friction and its effect on mechanical efficiency. The friction effects on bearings and its uses in power transmission. In Chapter 7, types of governors for speed regulation are presented. Chapter 8 deals with transmission of power using belts, ropes and chains. Chapter 9 deals with gyroscopic effects on the vehicles such as two wheelers, four wheelers, aeroplanes and ship. Chapter 10 gives about different types of cams and their design. Chapter 11 deals with gears and their types. Chapter 12 gives the application of gears used for transmission of power. Chapter 13 and Chapter 14 deal with balancing of rotating masses and reciprocating masses. Chapter 15 and Chapter 16 are on the study of longitudinal, transverse and torsional vibrations.

Generally in many books, several examples will be given but in this book a few common examples are shown for different methods. This will enable students or new faculty to understand the relative merits and demerits of the methods. This will help them in choosing the right method for the given problem and the time it requires. For example, in the velocity and accelerations, whether to use instantaneous centre method or relative velocity method and in the governors, whether to use analytical or graphical method, etc. are given so that the students will not try in the examination time or new faculty in the classrooms while teaching.

Another highlight of this book is unlike other books where different problems are shown for different parameters whereas in this book, the same problem has been shown by changing each time one parameter. This will give a clear idea to students the effect of that particular parameter. For example in cams, the effect of follower, motion, whether it is offset or radial cam on its profile. In governors, Porter or Proell, unequal or equal arms, pivoted on the spindle or away from the spindle, etc. Students should not attempt by trial and error way especially in the examinations time.

The author has written this book by his forty years of teaching experience. This book will help not only to students but also to new faculty members for preparing well in all the above aspects with confidence. The international System of Units (SI) has been adopted throughout the book. The author thanks all those who influenced him in writing this book.

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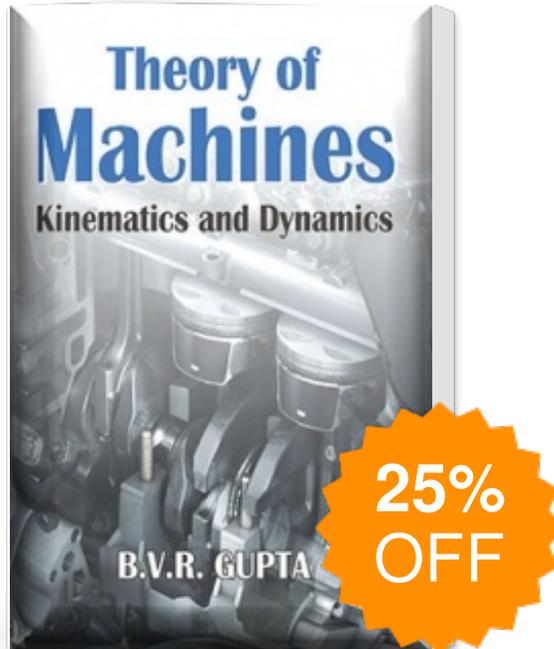
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