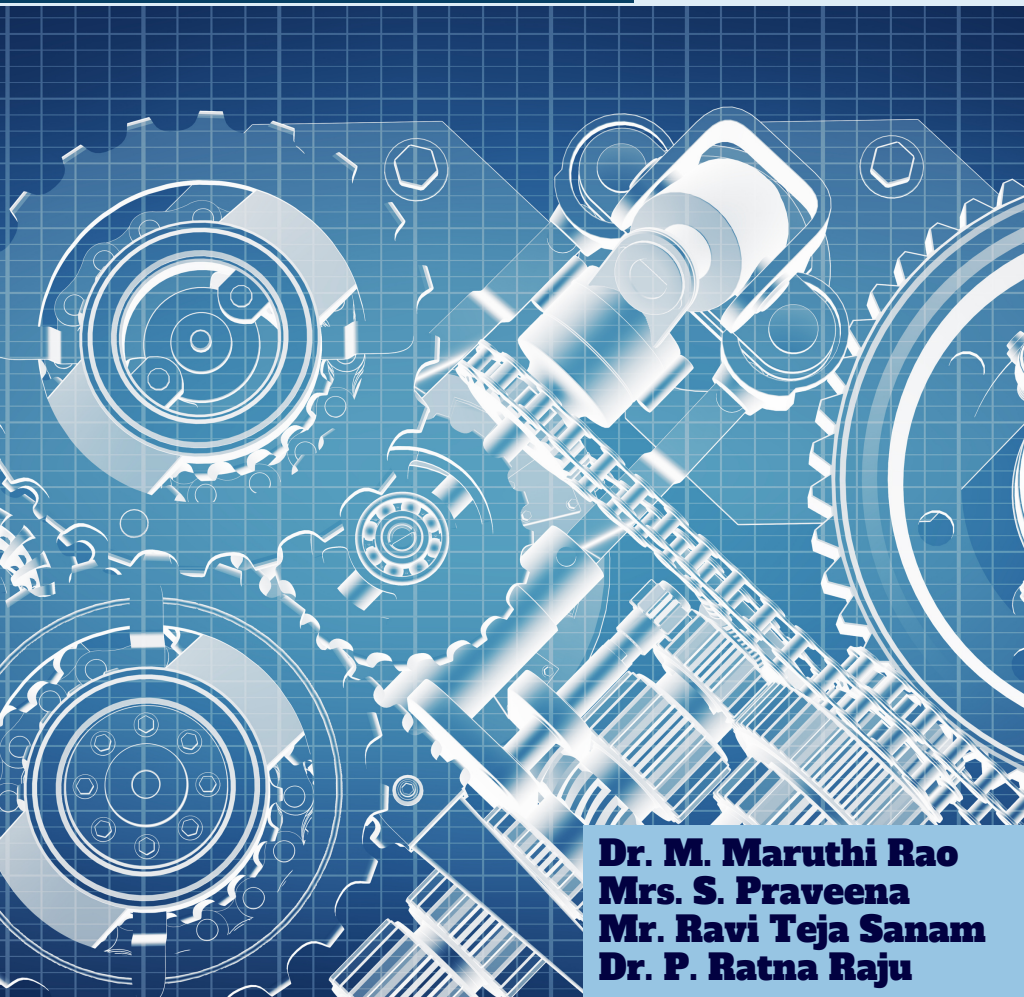


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BASIC CONCEPTS OF MECHANICAL ENGINEERING

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**Dr. M. Maruthi Rao
Mrs. S. Praveena
Mr. Ravi Teja Sanam
Dr. P. Ratna Raju**



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Basic Concepts of Mechanical Engineering



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BASIC CONCEPTS IN MECHANICAL ENGINEERING

(Common to all branches)
(B. Tech I Year I & II Semester as per JNTUA and JNTUK)

Dr. M. MARUTHI RAO
S. PRAVEENA
RAVI TEJA SANAM
Dr. P. RATNA RAJU

PREFACE

Welcome to the world of mechanical engineering! "Basic Concepts in Mechanical Engineering" is your comprehensive guide to the fundamental principles and concepts that form the bedrock of this exciting field. Primarily intended for mechanical engineering students at various levels, it's also a valuable resource for those from other disciplines seeking basic knowledge. We've aimed to make the content accessible to all readers, regardless of their prior experience.

Drawing from our collective experience as educators, researchers, and practitioners, we've strived to present the material clearly and engagingly, emphasizing a deep understanding of core concepts. We encourage active learning through examples, exercises, and thought-provoking questions. Dr. M. Maruthi Rao contributed to Thermal Engineering and Mechanical Power Transmissions. Smt. S. Praveena authored the sections on Engineering Materials and Introduction to Robotics. Sri. Ravi Teja Sanam covered Introduction to Mechanical Engineering, Role of Mechanical Engineering in Various Sectors, Manufacturing Processes, and Power Plants.

We welcome any suggestions, omissions, or error reports for the improvement of this book; they will be acknowledged and incorporated in the next edition.

Dr. M. Maruthi Rao
S. Praveena
Ravi Teja Sanam
Dr. P. Ratna Raju

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The author, **Dr. M. Maruthi Rao**, expresses his sincere gratitude to his children, **Ms. M. Jaya Sri** and **Ms. M. Gnana Sri**, for their kind cooperation and support, which greatly contributed to the successful completion of this book. Their patience, understanding, and encouragement have been a constant source of motivation.

The author, **Mrs. S. Praveena**, gratefully acknowledges **Dr. M. Maruthi Rao** for his expert guidance and unwavering support throughout the development of this book. She extends heartfelt thanks to her parents, **Smt. S. Thulasi Garu** and **Sri S. Venkata Ramana Reddy Garu**, for their steadfast moral support, and to her life partner, **Sri V. Srikanth Reddy**, for his continuous encouragement and belief in her professional journey.

The author, **Mr. Ravi Teja Sanam**, expresses his deep gratitude to his parents, **Smt. S. Prasuna Garu** and **Sri S. Sai Ram Reddy Garu**, for their invaluable blessings and lifelong support. He also offers special thanks to his life partner, **Smt. Sri Durga Sanam**, and their children for their unconditional love, patience, and strength, which were instrumental in the successful completion of this work.

Lastly, the co-authors collectively express their profound appreciation to **Dr. M. Maruthi Rao** for his continued insightful guidance, encouragement, and intellectual mentorship throughout the research and writing process. His contributions have been pivotal in shaping the content and direction of this book.

This book is lovingly dedicated to **our beloved students**, whose curiosity, enthusiasm, and pursuit of knowledge continually inspire us. *With love and gratitude, we acknowledge your role in shaping this journey.*

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FOREWORD

Engineering, often described as the art of turning science into practical solutions, lies at the very heart of human progress. Among its many branches, Mechanical Engineering stands as a beacon of innovation and ingenuity. This field, which blends the principles of physics, mathematics, and material science, has continually pushed the boundaries of what is possible, shaping our world in profound ways.

“Basic Concepts in Mechanical Engineering” is a testament to the enduring importance and fascination of this discipline. In its pages, readers will embark on a journey through the fundamental concepts, theories, and applications that underpin the remarkable field of mechanical engineering.

From the role of mechanical engineers to the technologies in different sectors like energy, manufacturing, automotive, aerospace and marine sectors, “Basic Concepts in Mechanical Engineering” provides a comprehensive foundation for those embarking on their engineering journey. It not only imparts the theoretical knowledge necessary for success but also offers practical insights as real-world engineering applications.

From the invention of the wheel to the development of cutting-edge robotics and aerospace technologies, the impact of mechanical engineering on society has been nothing short of revolutionary. This book encapsulates the essence of that legacy, allowing readers to connect with the spirit of innovation that drives this field forward.

The authors of this book have drawn upon their wealth of experience and expertise to create a work that not only educates but also inspires. Through clear explanations, illustrative examples, and practical applications, they empower readers to explore the endless possibilities that mechanical engineering offers.

May this book be your compass as you navigate the intricate landscapes of manufacturing processes, basics of thermal engineering, power plants, mechanical power transmission, introduction to robotics and may it inspire you to become an architect of a brighter, more innovative future.

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Smt. S. Praveena received her B.Tech from JNTU Anantapur (CREC Tirupati) and her M.Tech in CAD/CAM from JNTU Anantapur (SIETK Puttur). She has published multiple research papers in well-regarded national and international journals. With more than 10 years of teaching experience, she has also worked as a Design Engineer at AZAD Engineering Pvt. Ltd. (Hyderabad). Currently, she serves as an Assistant Professor in the Department of Mechanical Engineering at AITS College, Tirupati. Her research interests include design, manufacturing, materials science, and design software.



Ravi Teja Sanam holds a B.Tech degree from SKIT Engineering College, Sri Kalahasti and M.Tech in Thermal Engineering from Jawaharlal Nehru Technological University, Hyderabad. He has published several research papers in reputed national and international journals. With valuable experience in both academia and industry, he is currently serving as an Assistant Professor in Dept. of Mechanical Engineering at AITS, Tirupati. His areas of interest include Internal Combustion (IC) Engines, Thermal Engineering, Alternative Fuels, and other practical applications in the field of thermal sciences.



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