Materials Forming, Machining and Tribology

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A Brief History of Mechanical Engineering

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To
Mechanical Engineering Fraternity

Preface

Mechanical engineering is concerned with reducing or eliminating physical effort of humans or domestic animals with the help of tools and/or machines. In that sense, mechanical engineering has been in existence almost since the primitive man was born on the Earth; tools in very crude form must have been used by the primitive man. Wheel was invented a few millennia before Christ, and theory of lever was proposed a few centuries before Christ. However, up to nineteenth century, the distinction between science and engineering was blurred. Different disciplines of engineering did not have separate identity. Mechanical engineering emerged as separate strong discipline of engineering in nineteenth century. The Institution of Engineers was formed in 1847 in UK. Today, mechanical engineering is flourishing along with its offspring like production engineering, industrial engineering, manufacturing engineering, mechatronics, automobile engineering, and aerospace engineering. In spite of it, most of the persons are not familiar with the history of mechanical engineering. There are a very few books on this topic, and they have been written a few decades ago. Since then, a lot of changes have taken place in mechanical engineering with the general development of technology in various fields particularly in electronics and computer science. At the same time, growing industrialization and population have put tremendous pressure on environment forcing us to think about the issue of sustainability. A book on the history of mechanical engineering narrating the development of this discipline since the times immemorial till modern age is the need of the hour. In this backdrop, three of us decided to write a brief history of mechanical engineering.

We decided to keep our treatment brief only, so that the book can be useful for professionals interested in a quick grasp of the history of mechanical engineering as well as for general public. Due to concise and simplified narration, the book can be used as a textbook for one-semester elective courses in engineering, management, or humanities. The attempt has been not only to present the development in the field of mechanical engineering chronologically but also to explain related technological

concepts in a highly simplified form. This will help the general audience to understand mechanical engineering and will be a recapitulation for mechanical engineers.

There are eight chapters in this book. Chapter 1 "What is Mechanical Engineering?" provides an introduction to mechanical engineering and describes its scope and objectives along with some discussion on the educational aspects of mechanical engineering. Chapter 2 "Landmark Revolutionary Inventions in Mechanical Engineering" discusses the history of landmark inventions as well as their working principle. The readers with imaginative minds will find this chapter very exciting. The chapter describes the development of those technological products, which have become very common in day-to-day life and it is difficult to live without some of those products, and yet there was a time, when the engineers were struggling to develop them.

Chapter 3 "History of Mechanics" describes the development of mechanics since the times of Aristotle to Einstein. Biographical details of the leading pioneers are also provided. Mechanics comprises solid mechanics as well as fluid mechanics and is a part of physics and mathematics. It finds profound application in civil and mechanical engineering. Chapter 4 "History of Thermodynamics and Heat Transfer" describes the development of thermodynamics beginning from about one century before Sadi Carnot (1796–1832). Sadi Carnot is considered as the father of thermodynamics. In that sense, thermodynamics is much younger to mechanics and got impetus from the development of steam engine. Heat transfer is considered to have started since the period of Newton. Apart from mechanical engineering, thermodynamics and heat transfer are important subjects of physics, mathematics, and chemical engineering.

Chapter 5 "Manufacturing through Ages" describes the history of manufacturing. The development of steam engine provided an impetus to industrial revolution (circa 1750–1850). Various machine tools were invented in this period. Manufacturing sector took a momentum with the concept of mass production. Today, 3D printing may produce economical product even when producing a single component. In this chapter, apart from the history of technological inventions, a review of various manufacturing processes (particularly machining and metal forming) is presented. Chapter 6 "Emergence of Production and Industrial Engineering" presents a brief history of production and industrial engineering. Production and industrial engineering have emerged as separate disciplines, but they are also part of a typical mechanical engineering curriculum. The students and professionals of management may also find this chapter interesting.

Chapter 7 "History of Mechatronics" describes the developments in the field of mechatronics starting from 1970s to early 2010s. This chapter contains the history of electrical engineering, as well as electronics engineering. Developments in the area of computer science and engineering are also discussed. Finally, the importance of these developments in the mechanical engineering is discussed. Mechatronics is the synergetic combination of mechanical engineering, electronics

engineering as well as other related disciplines. Chapter 8 "Future of Mechanical Engineering" concludes the book. It discusses the future trend based on the past history and present state of the art. It also provides some guidelines to mechanical engineering students and professionals.

This book will be useful for the professional and budding engineers for getting a general knowledge of the subject and familiarity with its history. It will also be helpful for school-level students planning to take up mechanical engineering as a profession. Finally, the book may be useful for anyone interested to know about mechanical engineering. The book may be adopted for a one-semester course on the history of mechanical engineering. It can also serve as a reference book for a course introducing the mechanical engineering.

While writing this book, a number of books, papers, and Web sites have been referred. The references have been listed. Any omission is inadvertent. Readers are requested to point out any correction. We shall try to incorporate it in future editions. We also request the readers to provide their valuable feedback through e-mails at uday@iitg.ac.in or pdavim@ua.pt.

We are grateful to our family members and friends for their encouragement and patience. We are thankful to Mr. Vinod Yadav, Ph.D. student of Department of Mechanical Engineering, Indian Institute of Technology Guwahati, for drawing some figures. We also thank the staff of Springer especially Dr. Mayra Castro for the kind cooperation we received.

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