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Series Preface

The Wiley-ASME Press Series in Mechanical Engineering brings together two established leaders in mechanical engineering publishing to deliver high-quality, peer-reviewed books covering topics of current interest to engineers and researchers worldwide.

The series publishes across the breadth of mechanical engineering, comprising research, design and development, and manufacturing. It includes monographs, references and course texts.

Prospective topics include emerging and advanced technologies in Engineering Design; Computer-Aided Design; Energy Conversion & Resources; Heat Transfer; Manufacturing & Processing; Systems & Devices; Renewable Energy; Robotics; and Biotechnology.

Preface

Manufacturing Engineering is to apply mathematics and science in practice to design, manufacture, and operate products or systems. *Manufacturing engineers* are responsible for designing, developing, and running manufacturing systems to produce competitive goods. In most universities' engineering curricula, the courses in a manufacturing program cover the fundamentals such as *mathematics, physics, computing engineering, management*, as well as disciplinary subjects such as *materials science, machine designs, solid mechanics, thermodynamics, fluid mechanics, manufacturing processes, and design optimization*. Currently, most engineering curricula cover as many sub-disciplines of mechanical and manufacturing engineering as possible and students take their options to be specialized in one or more sub-disciplines. Therefore, existing curricula are mostly discipline-oriented.

Designs of modern products and processes are very complex, and complex designs rely heavily on computer aided technologies. However, computing and information technologies have been developed in a way that is very different from the manufacturing engineering education. Numerous computer aided tools become commercially available; moreover, the number and capabilities of computer tools keep increasing continuously. These tools are usually application-oriented and they have been developed by integrating design theories in multiple disciplines, rather than the theories and methods in an individual discipline. Due to the strongly decoupling of multiple disciplines, the classification of sub-disciplines in traditional engineering curricula is not aligned with the varieties of computer aided tools.

The misalignment of the discipline-oriented curricula and a variety of functional computeraided tools cause the dilemma in manufacturing engineering education. *On the one hand*, the sub-disciplines in manufacturing engineering are highly diversified. Keeping an increasing number of elective courses in an engineering programme becomes a great challenge since the number of required credit hours for an engineering degree has been continuously reduced in public university systems. *On the other hand*, engineering universities are facing an increasing pressure to train students for the appropriate set of knowledge and skills of using advanced computeraided tools to solve complex design problems. There is an emerging need to re-design engineering curricula so that the CAD/CAM-related courses can be aligned with discipline-oriented curricula.

We deal with this misalignment by proposing a new course framework to integrate *Computer Aided Design (CAD)*, *Computer Aided Manufacturing (CAM)*, and other Information Technologies (ITs) in one course setting. In the framework, the inclusion of engineering disciplines and computer aided technologies are driven by the needs in designing products

and manufacturing processes. While the theories in engineering disciplines are used to clarify design and analysis problems, computer aided tools are presented as the corresponding solutions. In addition, the framework is modularized and the course contents can be customized for some specialties.

The current version is customized to meet education needs of students in *Mechanical Engineering*, *Manufacturing Engineering*, and *Industrial Engineering* at junior or senior levels. It consists of three parts: Part I – *Computer Aided Design (CAD)*, Part II – *Computer Aided Manufacturing (CAM)*, and Part III – *System Integration*. Part I includes Chapter 2 – *Computer Aided Geometric Modelling*, Chapter 3 – *Knowledge-Based Engineering*, Chapter 4 – *Platform Technologies*, Chapter 5 – *Computer Aided Reverse Engineering*, and Chapter 6 – *Computer Aided Machine Design*. Part II includes Chapter 7 – *Group Technology and Cellular Manufacturing*, Chapter 8 – *Computer Aided Fixture Design*, Chapter 9 – *Computer Aided Manufacturing (CAM)*, Chapter 10 – *Simulation of Manufacturing Processes*, and Chapter 11 – *Computer Aided Design of Tools, Dies, and Moulds (TDMs)*. Part III includes Chapter 12 – *Digital Manufacturing (DM)*, Chapter 13 – *Direct and Additive Manufacturing*, and Chapter 14 – *Design for Sustainability (D4S)*.

The concepts of CAD, CAM, and system integration are not new; a number of textbooks on these subjects have been on the market for a long time. However, CAD, CAM, and system integration technologies have been greatly advanced recently due to the rapid development of IT and computer hardware and software systems. Most of the available textbooks in relevant subjects become obsolete in terms of design theories, methods, and technical coverages. Modern manufacturing systems in the digital era become ever more complicated, and product and system designs demand more advanced computer tools to deal with the complexity, varieties, and uncertainties. In contrast to other textbooks in similar areas, this book is featured (i) to update computeraided design theories and methods in modern manufacturing systems and (ii) to cover mostly advanced computeraided tools used in digital manufacturing. It will be an ideal textbook for undergraduate and graduate students in *Mechanical Engineering*, *Manufacturing Engineering*, and *Industrial Engineering* and can be used as a technical reference for researchers and engineers in mechanical and manufacturing engineering or computer aided technologies.

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About the Companion Website

The companion website for this book is at

www.wiley.com/go/bi/computer-aided-design



The website includes:

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Scan this QR code to visit the companion website.

