Preface

Industrial Hand and Power Tools was written to serve as the primary textbook for a course dedicated to tools or as a companion textbook for a course with significant tool coverage. Now that *Industrial Hand and Power Tools* is available, some programs may even decide to add a dedicated course in tools where none previously existed, freeing up space in other courses for more trade-specific content. Such a course can also be an introductory core class for multiple programs. *Industrial Hand and Power Tools* works equally well as part of an industrial company's workforce development training.

While most students come to introductory trades classes with some knowledge and experience in tools, some of the students have little or none. *Industrial Hand and Power Tools* was written with both populations of students in mind. For those who have very little tool knowledge, the text covers all of the basics, assumes no prior knowledge, and ensures that students learn proper methods from the start. The students who have some prior tool knowledge will most likely discover that they had some gaps in their knowledge, or that some of their previous knowledge was incorrect.

Industrial Hand and Power Tools is a foundational, comprehensive text designed to help students identify, select, and properly use common hand and power tools used in industrial and manufacturing careers. Each tool chapter includes the following:

- Categories of the tool
- A description of each tool type
- An image or diagram of the tool
- Specific uses and applications for the tool
- Safe and effective usage
- Proper care and storage

Additional content that complements tool knowledge includes the following:

- Comprehensive discussions of fasteners, both threaded and non-threaded
- Tools and techniques for thread formation and repair
- Measurement principles, as a lead-in to comprehensive discussion of measurement tools
- Calibration of measurement tools
- Materials (mainly steel) as they apply to tools and fasteners
- Physics (specifically mechanics) as it applies to tools and fasteners, with minimal math
- Suggestions for building a comprehensive, but still portable, personal technician's toolbox

It is my hope that students using this book will learn what they need to know and will also develop a heightened interest in and appreciation for tools. Using tools to accomplish a task, especially when they are used in the best and safest way possible, is a very satisfying and enjoyable experience. When I am building or repairing something, I take great satisfaction in knowing that I have all of the tools and skills I need to do that task. As this book was being developed, I used it in draft form for my own tools class. Nearly all of my students told me that they found it to be very readable, engaging, and refreshingly different from other textbooks. I have made my best effort to present only the most important information and avoid excessive detail.

Jim Jozwiak

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About the Author

Jim Jozwiak is an assistant professor at the College of Western Idaho (CWI) currently teaching classes in the Advanced Mechatronics Engineering Technology (AMET) program, including a class in basic hand and power tools. He has an M.S. in Electrical Engineering and an M.S. in Adult and Organizational Learning. He has spent the majority of his professional life (nearly 30 years) working in the semiconductor manufacturing industry (mostly at Intel and Micron). Much of that time he was an equipment engineer, working side-by-side with technicians to develop and maintain high-technology equipment. He also worked in workforce development, including developing and delivering training for technicians in the use and care of tools. When Jim began teaching at CWI, the tools class he was assigned to teach had recently been expanded from one to three credits, but none of the new content had yet been developed, so that task fell to him as well. When he was unable to find a suitable textbook, he began pulling together his own materials, which led to the creation of *Industrial Hand and Power Tools*, his first book. Jim has authored or coauthored over a dozen published technical papers and articles and is coinventor on two US patents. Jim offers loving appreciation to his father, from whom he learned much of what he knows, including an appreciation of the importance and usefulness of tools.

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Reviewers

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Credentialing Partners and Support

Goodheart-Willcox appreciates the value of industry credentials, certifications, and accreditation. We are pleased to partner with leading organizations to support students and programs in achieving credentials. Integrating industry-recognized credentialing into a career and technical education (CTE) program provides many benefits for the student and for the institution. By achieving third-party certificates, students gain confidence, have proof of a measurable level of knowledge and skills, and earn a valuable achievement to include in their résumés. For educators and administrators, industry-recognized credentials and accreditation validate learning, enhance the credibility of programs, and provide valuable data to measure student performance and help guide continuous program improvement.

NIMS Credentials

The tools covered in *Industrial Hand and Power Tools* are essential in a wide range of industry sectors, such as manufacturing and maintenance. Industry professionals use these tools to perform their task-related job duties to increase efficiency, productivity, and precision. In many scenarios, tasks cannot be executed without the use of these tools. As NIMS portfolio of competency-based credentials are strategically aligned with industry job roles, candidates must be skilled and knowledgeable in the use of industrial hand and power tools to earn credentials. The Interactive Standards Viewer (ISV) (isv.nims-skills.org) is a public repository of industry job roles that you can explore to see how your skills and knowledge of the tools discussed in *Industrial Hand and Power Tools* can be put to use. For more information about NIMS, visit nims-skills.org.

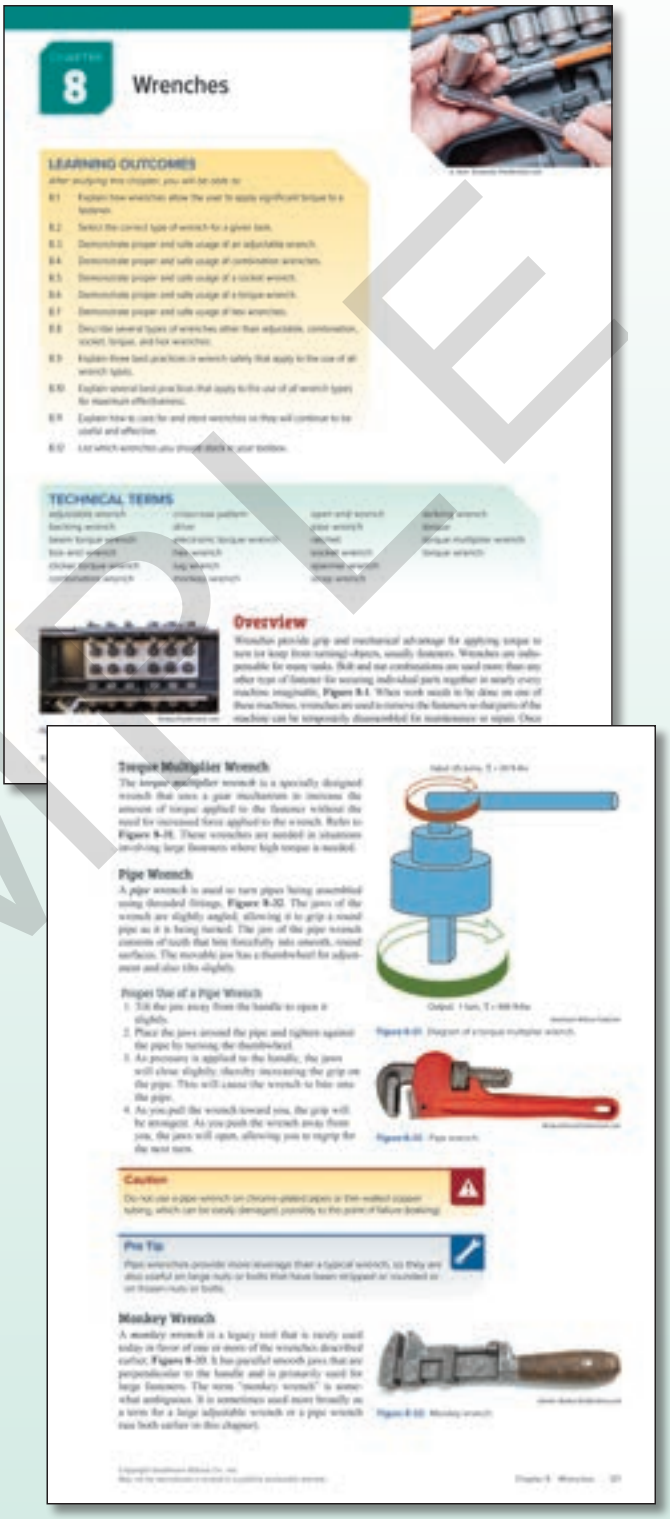
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Features of the Textbook

The instructional design of this textbook includes student-focused learning tools to help you succeed. This visual guide highlights these features.

Chapter Opening Materials

Each chapter opener contains a list of learning outcomes and a list of technical terms. **Learning Outcomes** clearly identify the knowledge and skills to be gained when the chapter is completed. These outcomes are labeled and correlated to related assessment elements to facilitate reporting and remediation. **Technical Terms** list the key words to be learned in the chapter. (All of these technical terms are defined in a comprehensive glossary at the end of the text.) An **Overview** provides a preview of the chapter content.



Content Features

Content features are used throughout the body of each chapter to further learning and knowledge. **Step-by-step instructions** describe the proper use of many tools. **Safety Tips** alert you to pitfalls encountered with tool use and emphasize protecting workers and tools. **Cautions** alert you to situations that could potentially harm yourself or others, as well as damage equipment or instruments. **Pro Tips** offer advice and guidance that is especially applicable for on-the-job situations.

Tool Photos and Illustrations

Color photos and illustrations are featured throughout the text to make it easy for students to clearly identify the right tool for the job. Many "anatomy of a tool" illustrations label specific parts of tools to highlight functions and their locations. Proper body positioning for use with certain tools is also highlighted.

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Safety Tip

Pro Tip

Proper Use of Sheet Metal Cutters

Aviation Snips

- **Green handle.** Curved cut to the right
- **Yellow handle.** Straight cut
- **Red handle.** Curved cut to the left

Hands-On Activity

Wrench Usage on Threaded Fasteners

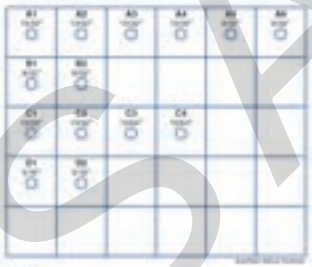
Name _____ Date _____ Class _____

Objectives

Materials Needed

- Safety glasses
- Work gloves
- Two predrilled metal plates* (see Exhibit 8-1)
- Bin with variety of fasteners (see Exhibit 8-2)
- Selection of wrenches (see Exhibit 8-3)

*Prepared by your instructor.



List of Wrenches	
Description	Qty per Kit
Adjustable wrench, 6" or larger	1
Combination wrench set, SAE	1
Socket wrench set, SAE	1
Torque wrench (beam, clicker, or digital)	1

List of Fasteners for Each Kit	
Description	Qty per Kit
Hex bolt, 3/8" dia. × 1-1/2"	4
Hex nut, 3/8" dia.	4
Flat washer, 3/8"	12
Lock washer, 3/8"	1
Lock nut, 3/8" dia.	1
Hex bolt, 1/4"-20 × 1-1/4"	4
Hex nut, 1/4"-20	4
Flat washer, 1/4"	10
Lock washer, 1/4"	1
Lock nut, 1/4"-20	1
Socket head bolt, 3/8" dia. × 1-1/2"	2
Socket head bolt, 10-24 × 1"	2
Hex nut, 10-24	2
Flat washer, 10	4
Carriage bolt, 1/4"-20 × 1-1/4"	2
Wing nut, 1/4"-20	1

End-of-Chapter Content

End-of-chapter material provides an opportunity for review and application of concepts. A concise **Summary** provides an additional review tool and reinforces key learning outcomes. This helps you focus on important concepts presented in the text. **Know and Understand** questions enable you to demonstrate knowledge, identification, and comprehension of chapter material. **Apply and Analyze** questions extend learning and develop your abilities to use learned material in new situations and to break down material into its component parts. **Critical Thinking** questions develop higher-order thinking and problem-solving abilities. **Identification Tests** assess your ability to distinguish and recognize tools as well as their parts.

Hands-On Activities actively engage you to apply what you learned by practicing the use of tools in a classroom workshop and answering questions to reflect on the results. **Instructor Evaluation/Competency Test** tables are provided for these activities so that you have a clear understanding of competency expectations and instructors have ready-made grading criteria. The author has personally field-tested these activities with students in his own course.

Appendices

Appendix A provides suggestions for building your own toolbox. It describes three different tool sets: minimal, optimal, and comprehensive. Each version includes a list of recommended tools and a photograph of the tools that are included.

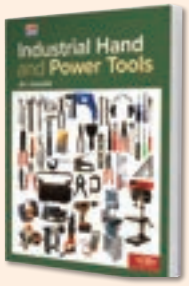
Appendix B provides information about different organizations whose charter includes hand tools, power tools, safety, or other topics that were covered in this book. These organizations are valuable sources of additional information.

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TOOLS FOR STUDENT AND INSTRUCTOR SUCCESS

Student Tools

Student Text



Available in print and digital, *Industrial Hand and Power Tools* is a foundational, comprehensive text designed to help students identify, select, and properly use common hand and power tools used in industrial and manufacturing careers.

G-W Digital Companion

- For digital users, e-flash cards and vocabulary exercises allow interaction with content and engage students beyond the text.
- Interactive activities provide invaluable practice to identify tools and their parts.

EduHub LMS-Ready Content

- Students will enjoy intuitive digital resources in your school's preferred platform.
- The digital platform encourages application and discovery.
- Provides easy-to-use access and navigation.
- **Industrial Hand and Power Tools Videos** demonstrate proper use of a variety of common tools, accompanied by expert explanation.

Instructor Tools

LMS Integration

Integrate EduHub LMS-Ready Content into your preferred platform for a seamless user experience for both you and your students.

A Complete Teaching and Learning Package

- The **Online Textbook** builds student knowledge.
- **Industrial Hand and Power Tool Videos** demonstrate proper use of a variety of common tools.
- **Drill and practice** provides vocabulary activities.
- **Interactive activities** reinforce chapter content.
- **Industrial Hand and Power Tools Virtual Toolbox** provide additional drill and practice.
- **G-W Assessment** gives students easy access to assignments, tests and quizzes, instant feedback, and grades.

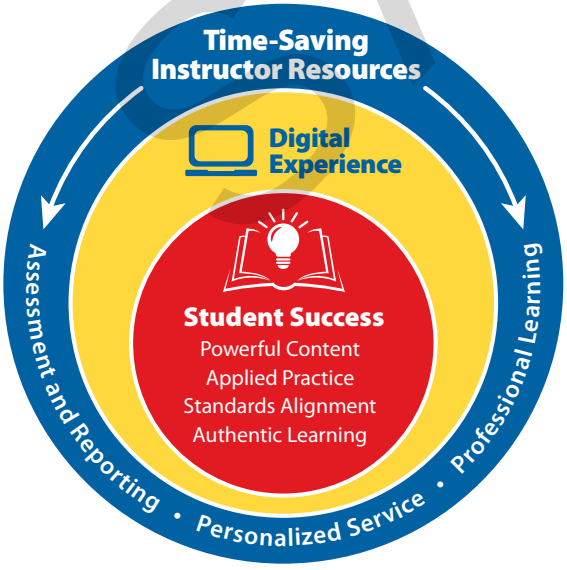
Online Instructor Resources

- Tap into timesaving preparation tools: answer keys, editable lesson plans, and other teaching aids.
- Take advantage of **Instructor's Presentations for PowerPoint®** with fully customizable, richly illustrated slides that help you teach and visually reinforce the key concepts from each chapter.
- Easily create, customize, edit, and print prebuilt questions and tests using G-W Assessment, our cloud-based platform. No more downloads, uploads, or imports needed! Student assessments are autograded and flow automatically into your gradebook when you integrate with your LMS.

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SAMPLE