

# Acknowledgments

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## Acknowledgments

### A Course Built on Collective Knowledge

This comprehensive CNC Engineering Course represents far more than a single author's work. It is the culmination of decades of accumulated wisdom from the manufacturing community, contributions from countless professionals, and the collaborative potential of modern technology. While no list can be truly complete, we acknowledge those who've made this educational resource possible.

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### The Manufacturing Community

#### To the Shop Floor Machinists

This course stands on the foundation of knowledge shared by working machinists—those who’ve spent decades perfecting their craft, troubleshooting failures at 3 AM, and discovering through trial and error what textbooks never teach. Your willingness to mentor newcomers, share hard-won lessons, and contribute to online forums has preserved expertise that might otherwise be lost.

### **To the CNC Community Forums**

- **CNC Zone:** For decades of archived discussions solving every imaginable machining problem
- **Practical Machinist:** For technical depth and professional discourse
- **Hobby-Machinist:** For welcoming beginners and celebrating learning
- **Reddit’s r/Machinists and r/CNC:** For real-time problem-solving and honest feedback
- **Facebook CNC Groups:** For connecting professionals across geographic boundaries

Your collective wisdom permeates this course. Every troubleshooting guide, every best practice, every “here’s what NOT to do” lesson draws from community knowledge.

### **To Manufacturing Engineering Educators**

To professors, technical instructors, and training program developers who’ve dedicated careers to teaching manufacturing principles—your pedagogical frameworks, course structures, and educational philosophies have influenced how this material is organized and presented.

### **To Technical Authors and Publishers**

This course references and builds upon principles established in foundational texts: - Erik Oberg and Franklin Jones (*Machinery’s Handbook*) - Edmund Isakov (machining handbooks and technical guides) - Peter Smid (CNC programming and G-code mastery) - Steve Krar and Arthur Gill (machine tool technology) - Countless authors of ASME, ISO, and industry standards

Your work created the technical foundation upon which modern manufacturing education stands.

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## **Industry Standards Organizations**

**American Society of Mechanical Engineers (ASME)** - For geometric dimensioning and tolerancing (GD&T) standards - For engineering drawing standards and practices - For quality and inspection methodologies

**International Organization for Standardization (ISO)** - For global manufacturing standards and harmonization - For quality management system frameworks (ISO 9001) - For metrology and measurement standards

**Society of Manufacturing Engineers (SME)** - For technical publications and research - For manufacturing process documentation - For professional development resources

**National Institute of Standards and Technology (NIST)** - For measurement science and calibration standards - For manufacturing technology research - For data and references used throughout this course

**Aerospace Industries Association (AIA)** - For AS9100 quality standards - For advanced manufacturing practices - For supply chain excellence frameworks

These organizations establish the standards that ensure manufacturing precision, quality, and interoperability worldwide. Their work is embedded throughout this course.

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## **Software and Technology Partners**

### **CAM Software Developers**

This course references principles applicable across platforms including: - Autodesk (Fusion 360, HSMWorks, PowerMill) - Mastercam (mill, lathe, and multi-axis solutions) - SolidCAM (integrated CAD/CAM) - Siemens (NX CAM) - PTC (Creo) - BobCAD-CAM - SprutCAM - Open-source alternatives (FreeCAD, LinuxCNC)

Your tools enable the manufacturing processes this course teaches.

### **CNC Control Manufacturers**

- Fanuc (industry standard controls and documentation)
- Haas Automation (accessible CNC technology)
- Siemens (Sinumerik controls)
- Heidenhain (precision control systems)
- Mazatrol (conversational programming)
- HURCO (conversational interfaces)
- LinuxCNC (open-source control)

Your control systems and programming languages are the foundation of Modules 7-11.

### **Measurement and Metrology**

- Mitutoyo (precision measurement tools)
- Starrett (measurement instruments)
- Hexagon (CMM and metrology software)
- Renishaw (probing systems)
- Keyence (optical measurement)
- ZEISS (coordinate measurement)

Your technologies enable the quality assurance methods taught in Modules 20-22.

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## **Open Source Software Community**

### **Open Source Software Community**

- Linux (operating system foundation for many CNC controls)
- Python (for calculations and automation examples)
- Git/GitHub (version control and collaboration)
- Markdown (documentation format)
- LaTeX (mathematical typesetting)
- Open-source CAD/CAM tools

The open-source philosophy of shared knowledge and collaborative improvement aligns perfectly with this course's mission.

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## **Business and Quality Frameworks**

### **Lean Manufacturing Pioneers**

- Taiichi Ohno and the Toyota Production System team
- James Womack and Daniel Jones (*Lean Thinking*)
- Jeffrey Liker (*The Toyota Way*)
- Shigeo Shingo (SMED and Poka-Yoke methodologies)

Module 24's L.E.A.N. strategies and Appendix S's comprehensive templates draw directly from principles these innovators established.

### **Quality Management Thought Leaders**

- W. Edwards Deming (statistical quality control)
- Joseph Juran (quality planning and management)
- Philip Crosby (zero defects and cost of quality)
- Genichi Taguchi (robust design methods)
- Six Sigma practitioners and Black Belts worldwide

Module 25's Quality Management Systems content reflects decades of quality methodology development.

### **Business and Entrepreneurship Resources**

- Small Business Administration (SBA) resources and guidance
- SCORE mentors and small business advisors
- Manufacturing Extension Partnership (MEP) centers
- Trade associations (NTMA, PMPA, AMT, and others)
- Business advisors and consultants who've shared case studies

Module 26's Business Ownership content and Appendix T's templates incorporate best practices from successful manufacturing entrepreneurs.

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## **Material Science and Process Resources**

### **Materials Suppliers and Technical Teams**

- Aluminum Association (alloy specifications and properties)
- Steel Manufacturers Association (steel grades and applications)
- Copper Development Association (brass and bronze data)
- Titanium metals producers (Ti alloy information)
- Plastics manufacturers (engineering plastic specifications)

Your technical data sheets, property tables, and application guides inform Module 3 and Modules 16-19.

### **Heat Treatment and Surface Treatment Specialists**

- Heat treating associations and technical societies

- Surface treatment providers (plating, coating, anodizing)
- Material testing laboratories
- Metallurgical consultants

Your expertise shapes the heat treatment (Module 17) and surface treatment (Module 18) content.

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## **Tool and Equipment Manufacturers**

### **Cutting Tool Companies**

- Sandvik Coromant (cutting tool innovation and education)
- Kennametal (tooling solutions and technical guidance)
- Iscar (cutting tool technology)
- Seco Tools (application expertise)
- OSG (taps, drills, and end mills)
- Harvey Tool (specialty cutting tools)
- Hundreds of other manufacturers large and small

Your technical catalogs, machining guides, speeds and feeds recommendations, and application examples form the foundation of Module 6 (Tooling Systems).

### **Machine Tool Builders**

- Haas Automation (democratizing CNC access)
- DMG MORI (advanced machining technology)
- Mazak (innovation in machine tools)
- Okuma (intelligent machine tools)
- Makino (precision machining centers)
- Hundreds of builders worldwide

Your machines are the platforms where this knowledge is applied.

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## **Educational Institutions**

### **Technical Colleges and Trade Schools**

To the thousands of technical instructors teaching CNC machining, manufacturing technology, and precision machining programs—you are on the front lines of workforce development. Your feedback, curriculum designs, and practical teaching methods have influenced this course's structure.

### **Engineering Schools and Universities**

To mechanical engineering, manufacturing engineering, and industrial engineering programs that balance theory with practical application—your academic frameworks provide context for why we teach not just how, but why.

### **Apprenticeship Programs**

To union training centers, manufacturer-sponsored apprenticeships, and formal training programs that combine classroom learning with hands-on experience—you demonstrate that mastery comes from the integration of knowledge and practice.

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## **Beta Reviewers and Early Adopters**

### **Technical Reviewers**

To the manufacturing professionals, experienced machinists, shop owners, and engineering educators who reviewed drafts, identified errors, suggested improvements, and validated technical accuracy—your expertise ensured this course meets professional standards.

### **Course Testers**

To those who worked through modules, attempted exercises, used templates, and provided honest feedback about what worked and what needed clarification—you made this course better for everyone who follows.

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## **The Hendrixx CNC Team**

### **Course Development**

- **Hendrixx** (Principal Author): Conceptualization, content direction, technical accuracy, practical application focus, business module development
- **AI Collaboration Team**: Content generation, organization, template development, consistency maintenance, rapid iteration

### **Technical Support**

- Repository management and version control
  - Documentation organization
  - Template testing and refinement
  - Community engagement and feedback integration
- 

## **Personal Acknowledgments**

### **To the Mentors**

Every manufacturing professional was once a beginner. To those who took time to explain, demonstrate, and teach—who patiently answered “stupid questions,” who shared tricks learned through experience, who prevented costly mistakes through wisdom—this course exists because of your generosity.

### **To Those Who Failed Forward**

To the shop owners whose businesses didn’t survive, but who shared their lessons learned. To the machinists who scrapped expensive parts and explained what went wrong. To the engineers

whose designs didn't manufacture well, leading to design-for-manufacturing insights. Failure teaches if we're willing to learn and share.

### **To the Next Generation**

To students, apprentices, career-changers, and aspiring manufacturing professionals—you are why this course exists. Your questions drive clarification. Your struggles reveal where explanation is needed. Your success validates that knowledge, when properly shared, empowers transformation.

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### **Standing on Shoulders**

Isaac Newton wrote, "If I have seen further, it is by standing on the shoulders of giants." This course stands on many shoulders:

- Craftspeople who developed machining techniques over centuries
  - Engineers who mathematized manufacturing processes
  - Educators who structured knowledge for effective teaching
  - Entrepreneurs who built businesses and shared lessons
  - Standards bodies who created frameworks for quality and safety
  - Technology companies who created tools that enhance capability
  - Community members who answer questions and solve problems
  - AI systems that can organize and present vast knowledge
  - Everyone who believes in shared knowledge and continuous improvement
- 

### **A Living Document**

This course will evolve. Manufacturing technology advances. New materials emerge. Processes improve. Best practices change.

We acknowledge in advance:

**Future Contributors:** Those who will identify errors, suggest improvements, add case studies, and enhance this resource. Your contributions will be recognized.

**Industry Innovators:** Those developing next-generation manufacturing technology. Your innovations will be incorporated as they mature.

**Students Who Become Masters:** Those who learn from this course and eventually teach others. You complete the cycle of knowledge transfer.

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### **How to Contribute**

This course improves through community contribution. If you identify errors, have suggestions, or want to contribute:

**Technical Corrections** - Submit issues on GitHub: [hendrixx-cnc/CNC-Engineering-Course](https://github.com/hendrixx-cnc/CNC-Engineering-Course) - Detail the error with module, section, and proposed correction - Include supporting references when possible

**Content Suggestions** - Propose new topics or expanded coverage - Share case studies or real-world examples - Suggest additional templates or tools

**Community Engagement** - Answer questions from other learners - Share your application experiences - Mentor newcomers to manufacturing

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## Dedication

This course is dedicated to:

**The manufacturing professionals** who build the physical world—who transform raw materials into precision components, who solve problems that have no textbook answers, who take pride in work that meets exacting standards.

**The educators** who invest in human potential—who believe in the power of knowledge to transform lives, who patiently explain complex concepts, who inspire curiosity and excellence.

**The innovators** who push boundaries—who question conventional wisdom, who seek continuous improvement, who believe there's always a better way.

**The learners** who commit to mastery—who persist through challenges, who embrace complexity, who understand that true competence requires dedication.

May this course serve you well on your manufacturing journey.

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## Legal and Licensing

### Copyright and Usage

This course content is © 2025 Hendrixx CNC Engineering.

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**Trademarks:** All mentioned company names, product names, and trademarks are property of their respective owners. Mention does not imply endorsement.



**Technical Accuracy:** While extensive effort ensures accuracy, this course is provided “as is” without warranty. Users assume responsibility for verifying information before application in critical situations.

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## Contact and Support

**Questions or Feedback** - GitHub Issues: Technical questions and course improvements - Email: info@hendrixx-cnc.com - Community Forums: Peer discussion and support

**Professional Services** For consulting, custom training development, or technical services: - Website: [Coming Soon] - Email: contact@hendrixx-cnc.com

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## Final Thanks

To everyone who contributed to making this comprehensive CNC Engineering Course possible—whether through direct contribution, inspiration, technical foundation, or simply by believing that high-quality technical education should be accessible—thank you.

Manufacturing builds civilization. Education empowers builders. Together, we advance both.

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*“We make a living by what we get, but we make a life by what we give.”*

– Winston Churchill

Thank you for being part of this community of makers, educators, and learners.