

Manufacturing Technology I

Introduction to Machine Technology

GRADE 9

June 2014

I. COURSE DESCRIPTION

Manufacturing Technology I is a full year study designed as a course to begin preparing the student for entry level employment in the Machining Industry or for post-high school training. The course is an introduction to the machine shop environment. The course covers the basic machine shop environment equipment. Included is the operation of machine shop equipment, understanding and use of related nomenclature, and production of custom entities. The course will also include general machining operations. It will cover measurement methods and metrology used in the machining industry. Various measuring devices and methods, used in the machining industry, will be covered.

This first year course is the entry point in obtaining the knowledge necessary to identify specifications and understand various related equipment by producing custom made entities. Students will be introduced to the Machinist's Core Skill Set that is necessary within a current day manufacturing environment. Students will be introduced to and gain exposure to basic machining principles and related equipment.

By studying these aspects of the subject, students will not only prepare themselves for exams, but they will gain a competitive edge in future course work and the Machining industry.

Students of Manufacturing Technology I will perform hands-on tasks, and thoroughly learn to safely operate the related equipment and components. Students will be introduced to Mastercam. Mastercam is a PC based program that is used for skilled technicians for the design of various projects. The student will also learn how to speak the correct manufacturing technology vernacular, as well as how to perform in a professional machine shop setting.

II. COURSE OBJECTIVES/OUTLINE

GRADE 9

- I. Introduction to Machining Technology
 - A. History of Machining
 - B. Evolution to Machine Tools
 - C. Role of Machining in Society
 - D. Major Machine Tools
 - E. Machinist Terminology
 - F. Machinist Handbook and On-Line Resources
 - G. Basic Tool Operation
 - H. Nontraditional Machining Processes
 - I. Automating the Machining Process
 - J. The Role of the Machinist
- II. Careers in Machining Technology
 - A. Job Categories
 - B. Job Preparation
 - C. Modern Machine Careers
 - D. Keeping Skills Current
- III. Safety
 - A. Shop
 - B. OSHA Guidelines
 - C. Personal Protective Equipment
 - D. Guards and Barriers
 - E. Handling and Lifting
 - F. Compressed Air
 - G. Lockout and Tagout
 - H. Hazardous Materials
 - I. Fire Safety
 - J. Hand Tool Safety
 - K. Drill and Grinding Safety
 - L. Lathe and Milling Machine Safety
- IV. Drawings
 - A. Dimensions
 - B. Drawing Information
 - C. Prints
 - D. Types of Drawings
 - E. Dimensioning
 - F. Tolerance
 - G. Thread and Thread Symbols
 - H. Blue Print Reading

- V. Measurement
 - A. Rule
 - B. Caliper
 - C. Vernier
 - D. Gages
 - E. Dial Indicators
 - F. Hole Measuring Devices
- VI. Layout Work
 - A. Making Lines on Metal
 - B. Squares
 - C. Measuring Angles
- VII. Hand Tools
 - A. Clamping Devices
 - B. Pliers
 - C. Wrenches
 - D. Screwdrivers
 - E. Striking Tools
 - F. Chisels
 - G. Hacksaw
 - H. Files
 - I. Reamers
- VIII. Fasteners
 - A. Threaded Fasteners
 - B. Non-Threaded Fasteners
 - C. Adhesives
- IX. Jigs and Fixtures
 - A. Jigs and Fixtures
 - B. Jig and Fixture Construction
- X. Cutting Fluids and Coolants
 - A. Types of Fluids
 - B. Application of Cutting Fluids
- XI. Drills and Drilling Machines
 - A. Drilling Machines
 - B. Drills
 - C. Drill-Holding and Work-Holding Devices
 - D. Cutting Speed and Feeds
 - E. Cutting Fluids
 - F. Sharpening Drills
- XII. Grinding
 - A. Abrasive Belt, Bench and Pedestal Grinders
 - B. Grinding Wheels
 - C. Wet-Type, Dry-Type Grinder and Hand Grider
 - D. Surface Grinder
 - E. Work-Holding Devices
 - F. Grinding Applications and Problems
 - G. Universal Tool and Cutter Grinder
 - H. Sharpening Cutters

- XIII. Lathe
 - A. Lathe Size and Parts
 - B. Lathe Work-Holding
 - C. Chucks
 - D. Cutting Tools and Tool Holders
 - E. Preparing and Cleaning Lathe
 - F. Facing and Turning Operations
 - G. Boring
 - H. Drilling
- XIV. Milling Machine
 - A. Types of Machines
 - B. Milling Operations
 - C. Milling Cutter Basics
 - D. Types of Cutters
 - E. Holding Devices
 - F. Cutting Speed and Feeds
 - G. Cutting Fluids
 - H. Work-Holding
 - I. Vertical Milling Machine
- XV. Mastercam
 - A. Introduction to Mastercam
 - B. Creating Basic Geometry – Method to Drawing 2D
 - C. Setting up Machine Group Properties – Stock, Workholding
 - D. Tool path Chaining - How to select geometry
 - E. Creating Tools – Tool Library's
 - F. Post Processors – Creating G-Code
 - G. Create Part Model and Program for Manufacture
 - H. Create Tool sheet
 - I. Machine the part complete to validate programming
 - J. Edit Mastercam File to match finished part

A. THE PATH OF THE MANUFACTURING EQUIPMENT OPERATOR

The student will be able to:

1. Grasp the concept of how to become a machining professional.
2. Understand the overall machining process.
3. Demonstrate the ability to properly operate within the workplace
4. Demonstrate the ability to understand measurements and materials
5. Demonstrate the importance of shop safety
6. Understand measurement systems.
7. Understand precision and semi-precision measurement
8. Understand Cutting Fluids and Coolants
9. Demonstrate the use of Hand Tools
10. Demonstrate the use of the Lathe
11. Demonstrate the use of the Drilling Machine
12. Demonstrate the use of the Milling Machine
13. Understand the aspects of Grinding
14. Demonstrate the use of Mastercam

New Jersey Core Curriculum Content Standards

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| 9.1.4.A.2 | Evaluate available resources that can assist in solving problems. |
| 9.1.8.A.4 | Design and implement a project management plan using one or more problem-solving strategies. |
| 9.1.4.D.3 | Demonstrate an awareness of one's own culture and other cultures during interactions within and outside of the classroom. |
| 9.1.4.F.3 | Explain the importance of understanding and following rules in family, classroom, and community settings. |
| 9.2.4.A.1 | Explain the difference between a career and a job, and identify various jobs in the community and the related earnings. |
| 9.3.4.A.4 | Identify qualifications needed to pursue traditional and nontraditional careers and occupations. |
| 9.3.4.A.5 | Locate career information using a variety of resources. |
| 9.4.12.B.(1).1 | Demonstrate communication skills and strategies that are used to work effectively with potential clients and others |
| 9.4.12.A.(3).1 | Recognize and employ universal construction signs and symbols to function safely. |
| 9.4.12.A.(3).2 | Use troubleshooting procedures when solving a maintenance problem to maintain project. |
| 9.4.12C.19 | Employ technological tools to expedite workflow. |
| 9.4.12C.36 | Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments. |
| 9.4.12C.37 | Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health. |
| 9.4.12.M.8 | Use correct grammar, punctuation, and terminology to write and edit documents. |

- 9.4.12.M.39 Maintain safe and healthful working conditions and environments to ensure employee safety.
- 9.4.12.M.30 Describe and use quality control systems and practices to ensure quality products and services.
- 9.4.12.M.32 Analyze and summarize how manufacturing businesses improve performance to demonstrate an understanding of various methods for enhancing production.
- 9.4.12.M.44 Employ leadership skills to accomplish goals and objectives.
- 9.4.12.M.46 Employ teamwork skills to achieve collective goals and use team members' talents effectively.
- 9.4.12.M.50 Apply ethical reasoning to a variety of situations in order to make ethical decisions.
- 9.4.12.M.52 Identify and demonstrate positive work behaviors and personal qualities needed to succeed in the classroom and/or to be employable.
- 9.4.12.M.53 Develop a Personalized Student Learning Plan to meet career goals and objectives.
- 9.4.12.M.54 Demonstrate skills related to seeking and applying for employment in a desired job.
- 9.4.12.M.55 Maintain a career portfolio to document knowledge, skills, and experience in a career field.
- 9.4.12.M.56 Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.
- 9.4.12.M.57 Identify and exhibit traits for retaining employment.
- 9.4.12.M.58 Identify and explore careers in one or more career pathways to build an understanding of the opportunities available in the cluster.
- 9.4.12.M.(1).2 Research new manufacturing processes to manage production of new and/or improved products.
- 9.4.12.M.(1).3 Develop quality improvement processes to maintain quality during the manufacturing production process.
- 9.4.12.M.(1).4 Develop a continuous improvement plan to ensure production of high quality products that meet customer expectations.
- 9.4.12.M.(2).1 Demonstrate how to communicate with others to ensure production meets business requirements.
- 9.4.12.M.(2).9 Design a product that satisfies a customer's desires to demonstrate the relationship between production processes and meeting customer needs.
- 9.4.12.M.(3).5 Develop hands-on knowledge of equipment operation to identify maintenance needs and maximize performance.
- 9.4.12.M.(3).6 Analyze and select installation, customization, or upgrade techniques in order to ensure the proper functioning of manufacturing equipment.
- 9.4.12.M.(3).7 Create a preventive maintenance schedule to maintain manufacturing equipment, tools, and workstations.
- 9.4.12.M.(3).8 Describe predictive and preventive maintenance strategies used to ensure that production processes run smoothly.
- 9.4.12.M.(3).9 Identify and diagnose equipment problems in order to effectively repair manufacturing equipment.
- 9.4.12.M.(4).2 Analyze and select strategies for coordinating work teams to produce a product that meets quality assurance standards.

- 9.4.12.M.(4).3 Evaluate production operations for product and process quality to maintain quality assurance.
- 9.4.12.M.(4).4 Demonstrate understanding of ways to enhance product and process to meet quality standards.
- 9.4.12.M.(4).5 Develop continuous improvement activities for use in the manufacturing environment to enhance the quality of products or processes.
- 9.4.12.M.(4).6 Employ processes, data, and tools to produce a product that satisfies customer needs for quality, value-added products.
- 9.4.12.M.(4).7 Analyze and select continuous improvement processes to maintain quality products and processes.
- 9.4.12.M.(4).8 Inspect manufacturing materials, report quality issues, and release only manufacturing materials that meet quality specifications.
- 9.4.12.N.74 Employ information management techniques and strategies to assist in decision-making.
- 9.4.12.N.75 Employ planning and time management skills and tools to enhance results and complete work tasks.
- 9.4.12.N.76 Understand tools and strategies used to access, process, maintain, evaluate, and disseminate marketing information to assist with business decision-making.

III. METHODS OF STUDENT EVALUATION

Students are evaluated using the following criteria:

1. Class participation
2. Periodic quizzes and tests
3. Shop work
4. Shop Projects
5. Notebook
6. Finished Products

IV. TEXTBOOKS AND INSTRUCTIONAL MATERIALS

Precision Machining Technology, Peter J, Hoffman, Eric Hopewell, Brian Janes, Kent Sharp.Jr. Delmar Cengage Learning, United States 2012 ISBN: 13 978-1-4354-4767-7

Machining Fundamentals, Ninth Edition, John R. Walker and Bob Dixon, The Goodheart-Willcox Company, Inc. Tinley Park, IL. 2004 ISBN: 978-1-61960-209-0

Machining Fundamentals, Workbook, John R. Walker. The Goodheart-Willcox Company, Inc. Tinley Park, IL. 2014 ISBN: 978-1-61960-214-4

Mastercam, CNC Software, Inc., Tolland, Connecticut

V. INSTRUCTIONAL STRATEGIES

Various teaching methods are used in this course. Classroom instruction will be given using prepared worksheets, class notes, instructional videos, and textbook exercises. Hands-on demonstrations, Direct Instruction, Independent Practice and Small-Group Instruction will be the primary teaching methods. Computer instruction will include demonstrations, examples and independent practice. Linking prior knowledge and skills will enable students to demonstrate their variety of skills in all aspects of a typical production machine shop.

VI. SCOPE AND SEQUENCE CHART

KEY:	I = INTRODUCED	D = DEVELOPED	R = REINFORCED
I.	Introduction to Machining Technology	I	D R
II.	Careers in Machining Technology	I	D R
III.	Safety	I	D
IV.	Drawings	I	D R
V.	Measurement	I	D R
VI.	Layout Work	I	D R
VII.	Hand Tools	I	
VIII.	Fasteners	I	D R
IX.	Jigs and Fixtures	I	D
X.	Cutting Fluids and Coolants	I	
XI.	Drills and Drilling Machines	I	
XII.	Grinding	I	
XIII.	Lathe	I	
XIV.	Milling Machine	I	
XV.	Mastercam	I	

VII. PACING CHART

I.	Introduction to Machining Technology	Weeks	1 - 2
II.	Careers in Machining Technology	Weeks	3 - 4
III.	Safety	Weeks	5 - 7
IV.	Drawings	Weeks	8 - 12
V.	Measurement	Weeks	13-15
VI.	Layout Work	Weeks	16
VII.	Hand Tools	Weeks	17 - 20
VIII.	Fasteners	Weeks	21
IX.	Jigs and Fixtures	Weeks	22
X.	Cutting Fluids and Coolants	Weeks	23
XI.	Drills and Drilling Machines	Weeks	24 -27
XII.	Grinding	Weeks	28
XIII.	Lathe	Weeks	29 - 32
XIV.	Milling Machine	Weeks	33 - 34
XV.	Mastercam	Weeks	35 - 36

VIII. STUDENT HANDOUT

COURSE OVERVIEW

Manufacturing Technology

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PROFICIENCIES

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