**MACHINE TECHNOLOGY PROGRAM OVERVIEW**

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| **MACH TECH** | **TOPIC**: **CERTIFICATE OF COMPLETION** | **CREDITS: 35** |
| **PURPOSE**: | To provide students with the foundational skills necessary to compete for an entry level position in a working machine shop environment, under supervision, and/or to acquire the prerequisite knowledge of machine tool technology to successfully advance to a higher level machining program.  |
| **OUTCOMES**: | * Be able to consistently demonstrate safe shop practices and procedures.
* Interpret and apply basic documentation and engineering specifications.
* Develop the ability to use basic precision measurements.
* Solve Technical Math Problems applicable to the machining trade.
* Perform fundamental material removal processes.
* Use fundamental skills to include writing, reading, interpretation, computing, speaking and listening to meet the needs of the workplace.
* Demonstrate fundamental work ready skills required for success in a team oriented workplace.
 |
| **COURSES:****TERM 1****TERM 2** | **ALL Common Courses are designated as MACH&** | **HOURS****(LEC/LAB)**  | **CREDIT VALUE** |
|

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| --- |
| **MACH&103** Safety 107 Precision Measurements109 Work Ready Skills111 Interpret/Apply Engineering Specs 115 Solve Technical Math Problems 119 Material Removal Processes I  |
|  |
| MACH&120 Intro to CNC Operation 121 Intro to CNC Programming 125 Shop Math Applications 127 Geometric Dimensioning and Tolerancing129 Precision Measurement II129 Material Removal Processes II |
| **TOTAL** |

 | 10/010/4010/010/2040/020/10020/4020/030/020/010/2020/40 | 131347**18**423224**17** |
| **35** |
| **PROGRAM DESIGN** | This program is designed to accommodate the needs of students with little to no machine tool or actual shop experience.  |
| **KEY EXPECTATIONS** | Students will have acquired the basic communication, computation and interpretive skills required to succeed in applied shop and problem solving situations.  |
| **POTENTIAL ENTRY LEVEL POSITIONS** | Apprentice/HelperMachinist HelperShop Assistant |

**TERM 1 COURSE OVERVIEW**

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| **MACH&103** | **TOPIC**: Safety | **TIME**: LEC 10 |
| **PURPOSE**: | Establish a culture of Safe Practices |
| **OUTCOMES**: | Given verbal and written instructions students will be able to demonstrate the use of safe shop practices in a shop environment. |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Use of Safe Practices while in a shop environment ( like lifting lock out tag out )
* Interpret SDS (MSDS) Sheets
* Use of PPE (Personal Protective Equipment )
* Interpret Machinery Caution Signs and Labels
* General Shop Safety (Chips, sharp objects, dangers of compressed air, chemicals)
* Fire, Earthquake/ Evacuation
* Machine Guards/ Safety Guards
* Equipment Specific Safety Practices
* Defective Tools or Equipment
 | **2/0****1/0****1/0****1/0****1/0****1/0****1/0****1/0****1/0** |
| **ASSESSMENT MEASURES** | * Safety Check sheets
* Knowledge exam ofmultiple choice questions @ 80% or better
* Demonstrating safe practices
 |
|  **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Safety videos
* Safety quizes
* online Training
* Demonstration of safe practices
* Manual and Mechanical Safe Lifting
 |
| **SUGGESTED KEY REFERENCES**: | * **Text books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp Jr.
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
* Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Videos**
* **Online Training Resources** (Tooling U)
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**TERM 1 COURSE OVERVIEW**

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| **MACH&107** | **TOPIC**: Precision Measurement I | **TIME**: LEC 10/LAB 40 |
| **PURPOSE**: | Introductory course covering the use of precision measuring tools such as micrometers, calipers, gage blocks and indicators. |
| **OUTCOMES**:  | * Given precision measuring tools, students will read and interpret measurements within the degree of accuracy for the measuring tools or setup tools
* Given proper reference material for machine shop formulas, students will select appropriate formula to calculate size/dimension verifications and angle calculations.
* Given indicators and common machine shop machinery, students will align machinery, fixtures and/or work pieces within the shop standard.
 |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Introduction to tolerance applications
* Use of Inspection tools to verify or measure work piece
* Introduction to documentation common to inspection
* Choose the appropriate measuring tool for the required degree of accuracy.
* Operate common measuring tools such as micrometers and gages to the resolution of the instrument.
* Align machines and work pieces to establish an accurate foundation for machining to engineering specifications.
* Accurately calculate dimensions required for size verification using process specific formulas.
 | **1/2****1/5****1/2****1/1****3/15****2/10****1/5** |
| **ASSESSMENT MEASURES** | * Assess comprehension through the use of electronic/textbook handout media.
* Measuring exercises performed on selected machined samples, and/or assigned projects to established standards.
* Alignment exercises on selected machinery, fixtures and work pieces to the established standards
 |
| **SUGGESTED KEY REFERENCES**: | * **Text books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp Jr.
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Other**: OnLine (Tooling U); Handouts; Example documents
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**TERM 1 COURSE OVERVIEW**

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| **MACH&109** | **TOPIC**: Work Ready Skills | **TIME**: LEC 10 |
| **PURPOSE**: | Introductory course to work ready skills |
| **OUTCOMES**: | Given verbal or written instructions students will demonstrate the ability to work and study within a diverse shop & classroom environment  |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Intro to Work Ready Skills
* Team work exercises
* Employer attendance policies
* Industry appropriate attire
* Effective communications techniques
* Industry communications
* Effective time management
* Conflict resolution
* Professional Hygiene
* Assessing Work ready Competency
* Review
 | **1/0****1/0****1/0****1/0****1/0****1/0****1/0****1/0****1/0****1/0** |
| **ASSESSMENT MEASURES** | * Attendance records
* Meeting assignment deadliness
* Instructor’s behavior checklist
* Self-evaluation checklist
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Teamwork exercises
* Conflict resolution drills
* Hygiene and attire models
* Communication exercises
 |
| **SUGGESTED KEY REFERENCES**: | * Keytrain (listening for comprehension, reading for information, teamwork)
* Handouts
* Textbooks
1. Inter Act: Interpersonal Communication, concepts, skills, and contexts, 12 Edition/Kathleen Verberber
2. Get A Job!, 5th Edition/Cunningham
* Electronic textbooks
* Internet accessed behavior check sheets
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**TERM 1 COURSE OVERVIEW**

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| **MACH&111** | **TOPIC**: Interpret/Apply Engineering Specs | **TIME**: LEC 10/LAB 20 |
| **PURPOSE**: | Interpret, apply, and understand engineering drawings, specifications and documentation. |
| **OUTCOMES**: | * Upon successful completion of this course, students will have the basic foundation to interpret beginning-level engineering drawings and specifications.
* Given examples of inspector’s documentation, students will research and locate appropriate standards information such as thread specifications in American National Standard Unified Inch Threads.
* Given precise step-by-step production documentation, student will model proper adherence to direction, and understand purpose.
 |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Basic components of a print
* Print Lines & Symbols
* Drawing views and projections
* Dimensions
* Title Blocks & Notes
* Introducing GD &T
* Part Tolerances
* Threads
* Inspection Documents
* Production documentation
 | **1/1****1/1****1/1****1/3****1/1****1/1****1/3****1/4****1/3****1/2** |
| **ASSESSMENT MEASURES** | 25% : Attendance/Participation25% : Lab Work25% : Homework assignments25% : Quizzes and Final 100% Total grade |
|  **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Work Sheets
* Research paper
* Reading assignments
* Measuring a part
* Producing a part from a drawing
* Team exercises where students produce and interpret each other’s documents
 |
| **SUGGESTED KEY REFERENCES**: | * Part prints produced to Industry standards
* Text book
1. Blueprint Reading for Machine Trades, 7th Edition/Russ Schultz & Larry Smith
2. Blueprint Reading Basics, 3rd Edition/Warren Hammer
3. Machine Trades Print Reading, 5th Edition/Michael A. Barsamian & Girchard A. Gizelbach
4. Machine Trades Print Reading, 4th Edition/ Michael A. Barsamian & Girchard A. Gizelbach
* Written tests
* Producing a part, filling out paper work
* American National Standard Unified Inch Threads
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**TERM 1 COURSE OVERVIEW**

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| **MACH&115** | **TOPIC**: Solve Technical Math Problems | **TIME**: LEC 20 |
| **PURPOSE**: | Introductory course covering basic applied math related to machining technology. |
| **OUTCOMES**: | Upon completion of this course, students will perform calculations using decimal and common fractions, ratios and measuring tools to solve mathematical problems to a minimum test score of 70% |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Common & Decimal Fractions & Mixed Numbers
 | **3**  |
| * Percentages
 | **3**  |
| * Order of Operations
 | **1** |
| * Ratios and Proportions
 | **2**  |
| * Linear Measurements (Common US/Metric)
 | **1** |
| * Tolerance, Clearance, Interference
 | **1**  |
| * Use of Gage Blocks and other measuring tools
 | **3** |
| * Cartesian coordinates
 | **1**  |
| * Decimal Fractions
 | **5**  |
| **ASSESSMENT** | * Complete all homework with a score of at least 70%
* Complete all quizzes with an average score of 70%
* Pass Mid-term & Final Exams with a score of at least 70%
 |
| **KEY EXERCISES/****VIDEOS**: | * Canvas Homework and Quizzes
* Mid-term & Final Math Exam
* Videos: www.shoreline.edu/clindberg/CNC113index.html
 |
| **KEY REFERENCES**: | **Textbook**1. Mathematics for Machine Technology, 6th edition Ch. 1- 32 & Ch.75 (electronic chapters available for $3.50/ chapter)/Robert D. Smith & John C. Peterson
2. Technical Shop Mathematics, 3rd Edition/Thomas Achatz

**Reference Books**1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
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**TERM 1 COURSE OVERVIEW**

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| **MACH&119** | TOPIC: Intro to Material Removal | TIME: LEC 20 LAB 100 |
| **PURPOSE**: | Introductory course on the removal of material in a modern machine shop. |
| **OUTCOMES**: | Upon completion of this course student will be able to demonstrate the setup and operation of lathes and milling machine to industry standards.  |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Safe setup and operation of a lathe
* Safe setup and operation of a milling machine.
* Correct speed, feed, and chip load calculations for milling and turning operations
* OD Turning including single point thread
* 2D milling—climb / conventional cutting
* Hole machining operations
* Basic tool geometry and tool bit grinding
 | **4/25****4/25****3/15****3/15****3/10****2/5****1/5** |
| **ASSESSMENT MEASURES** | * Check sheets
* Online tests
* Projects
* NIMS Credentials
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Plan set up and make projects
* Team exercises
* Measure projects
* Tooling-U
 |
| **SUGGESTED KEY REFERENCES**: | * **Text books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp Jr.
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Online training**
* **Online references** (Tooling U)
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**TERM 2 COURSE OVERVIEW**

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| **MACH&120** | **TOPIC**: Intro To CNC Operation | **TIME**: LEC 20 / LAB 40 |
| **PURPOSE**: | Introduction to setup and operation of CNC machines |
| **PREREQUISITES**  | Intro to CNC Programming previously or concurrently  |
| **OUTCOMES**: | * Using verbal or written instructions students will safely setup and operate the CNC machine to produce a part within tolerance.
* Using verbal or written instructions students will start up, perform maintenance, and shut down the CNC machine to shop standards
 |
| **TOPICS**: |  | **HOURS**: **LEC/LAB** |
|  | CNC axes destination movement | **1.0/1.0** |
| What is a Program Reference Zero | **1.0/2.0** |
| Safely Initializing and Shutting down a CNC Machine | **.5/2.0** |
| Responding to a CNC malfunction | **1.0/1.0** |
| Loading a program in the CNC machine | **1.0/2.0** |
| Controller modes and their functions | **2.0/4.0** |
| Safely Starting a new program | **1.0/2.0** |
| Perform a safe setup first run of a part, tear down and clean up | **5.0/9.0** |
| Utilizing CNC work holding devises | **1.0/2.0** |
| Proper use and selection of tools and tool holders | **1.0/2.0** |
| Components and mechanics of a CNC machine | **1.0/1.0** |
| Editing programs on a CNC machine | **1.0/4.0** |
| Performing Operator Preventative Maintenance  | **1.0/3.0** |
| Maintaining CNC Machine Coolant | **1.0/1.0** |
| Job Planning | **.5/1.0** |
| Setting Machine Offsets – Adjusting Cutter Compensation | **1.0/3.0** |
| **ASSESSMENT MEASURES** | * Written and/or on-line tests
* NIMS CNC Mill Operator or NIMS CNC Lathe Operator for example
* Lab Exam
* Student demos he/she can successfully load selected CNC program, setup/run CNC proj.
* Student demonstrates to the instructor that they can measure/inspect machined part
* Can control part feature profile is made to print specifications: +/-.002
* Instructor Observation
* Instructor observes that the student cleans and shut down CNC machine to shop specs
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Perform the various operations of a CNC Machine
* Operate the CNC machine to produce parts
* Worksheets, Tests, Field trips
 |
| **SUGGESTED KEY REFERENCES**: | * **Text books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* Online training (Tooling U); Videos/Youtube, Machine manufacturer training material
* Machine manuals
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**TERM 2 COURSE OVERVIEW**

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| **MACH&121** | **TOPIC:** Introduction To CNC Programming | **TIME:** LEC 20 / LAB 0 |
| **PURPOSE**: | Introduce students to the manual programming of a CNC machine. |
| **OUTCOMES**: | Given the CNC programming codes and explanations, students will produce handwritten CNC programs to control the operation of a CNC machine in an accurate and safe manner. |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Axis Coordinates XYZ ABC
* Proper Calculations of speeds and feeds
* G, M, and additional CNC programming code
* Tool Call up/Changes and Offsets T# = H# = D#
* Canned Cycles and Modal/Non-Modal Commands
* Programming format and Programming Syntax
* Incremental VS absolute
* Edge of part and Centerline of Tool path
* Cutter Compensation
* Crash Avoidance
* Control Specific Codes VS Industry Standard
* Lathe code vs. Mill code
 | **1****1****3****1****3****1****2****2****2****1****1****2** |
| **ASSESSMENT MEASURES** | * Written and/or on-line tests
* Assignments/Worksheets
* Prove program using machine simulator, machine graphics, verification software and/or CNC machine
* Instructor review of written CNC program
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Writing and proving program using machine simulator, machine graphics, or verification software
* Online training program like Immerse2learn.
* Write and run simple programs
* Read, troubleshoot and plot CNC code
 |
| **SUGGESTED KEY REFERENCES**: | * **Online training** (Immerse2learn; CNC Simulation software; Tooling U)
* **Textbooks**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp Jr.
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Programming Handouts**
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**TERM 2 COURSE OVERVIEW**

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| **MACH&125** | **TOPIC**: Shop Math II Applications | **TIME**: LEC 30/ 3cr. |
| **PURPOSE**: | Applying Intermediate Math in the Shop  |
| **OUTCOMES**: | Upon completion of this course, students will rearrange equations using principles of equality to solve for an unknown; multiply, divide, add, subtract algebraic expressions; apply formulas of cutting speed, revolutions per minute; use geometric principles to calculate values. |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS** |
| * Algebraic operations
 | **9**  |
| * Thread formulas
 | **1**  |
| * Arc Length formula
 | **1**  |
| * Applications of Formulas to Cutting Speed, Revolutions per Minute,
 | **2**  |
| * Feeds and Speeds
 | **6**  |
| * Geometric Principles (Angles, Pythagorean Theorem, Triangles, Circles)
 | **8**  |
| * Principles of Equality
 | **3**  |
| **ASSESSMENT** | * Quizzes
* Homework Assignments
* Pass Final Math Exam with 70% or better
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Canvas Homework and Quizzes
* Videos: www.shoreline.edu/clindberg/CNC106index.html
 |
| **SUGGESTED KEY REFERENCES**: | * **Textbooks**

1. Mathematics for Machine Technology, 6th edition Ch. 1- 32 & Ch.75 (electronic chapters available for $3.50/ chapter)/Robert D. Smith & John C. Peterson2. Technical Shop Mathematics, 3rd Edition/Thomas Achatz * **Reference Books**

1.Machinery’s Handbook, 29th Edition/Erik Oberg 2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley 3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner  |

**TERM 2 COURSE OVERVIEW**

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| **MACH&127** | **TOPIC**: Introduction to Geometric Dimensioning & Tolerancing (GD&T)  | **TIME**: LEC 20  |
| **PURPOSE**: | This course is intended to prepare the student to use Geometric Dimensioning and Toleranceing concepts to inspect part features and contrast them with the engineering drawing specifications.  |
| **OUTCOMES**: | Upon successful completion of this course, students will identify and apply Geometric Dimensioning and Toleranceing symbols and language to engineering drawings to the standards set by the program |
| **TIMING:** | **TOPIC**: | **LEC/LAB HOURS**  |
| * Geometric Symbols and terminology
* Feature Control Frames
* Rules 1, 2 and 3
* Virtual Condition
* Bonus Tolerance

Coordinate vs. Geometric Dimensioning* Coordinate and geometric Tolerances
* Datums, Tolerances of form, orientation, profile, location, and runout
 | **5/0****2/0****2/0****3/0****5/0****1/0****2/0** |
| **ASSESSMENT MEASURES** | * Measure parts
* Do diagnostic evaluations using GD&T standards
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Canvas Homework and Quizzes
* Textbook
* Electronic Textbook
* Videos:
 |
| **SUGGESTED KEY REFERENCES**: | **Textbooks:** 1. Interpreting Geometric Dimensioning and Tolerancing, 3rd Ed./Daniel Punchochar
2. Geometric Dimensioning and Tolerancing: Baed on ASME Y14.5- 2009, 8th Edition/ David A. Madsen
3. Fundamentals of Geometric Dimensioning and Tolerancing, 3rd Edition/Alex Krulikowski
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
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**TERM 2 COURSE OVERVIEW**

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| **MACH&129** | **TOPIC**: Precision Machining II | **TIME**: LEC 10 / LAB 20 |
| **PURPOSE**: | Build proficiency in measurement inspection, tools and techniques |
| **OUTCOMES**: | At the competition of this course students will be able to perform intermediate measuring techniques for inspection and layout to meet shop standards. |
| **TIMING:** | **TOPIC**: | **HOURS**: **LEC/LAB** |
| * Selection of fixturing for inspection
* surface plate techniques for inspection and layout
* Selection of measuring tools
* Datums and Features
* Hardness Measuring
* calibration theory
* Selection of inspection tooling
* Surface Finishes
 | **2/3****1/3****1/3****2/3****1/3****1/2****1/2****1/1** |
| **ASSESSMENT MEASURES** | * Students will inspect other students parts or pre-inspected parts
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Worksheets
* Setup and measuring parts
* Team measuring exercise
* Measuring physical standards to develop sensory accuracy
* Measuring complex features and other inspection challenges
 |
| **SUGGESTED KEY REFERENCES**: | * **Text books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Online training** (Tooling U)
* **Online references**
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**TERM 2 COURSE OVERVIEW**

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| **MACH&129** | **TOPIC**: Material Removal II | **TIME**: LEC 20/LAB 40 |
| **PURPOSE**: | Intermediate course on material removal in a modern machine shop |
| **OUTCOMES**: | At the completion of this course student will be able to use intermediate metal removal techniques on lathes and milling machines to make parts to industry standards. |
| **TIMING:** | **TOPIC**: | **HOURS LEC/LAB**: |
| * Process planning for machining operation lathe / Mill
* Advanced cutting techniques
* Selection of Carbide grades
* Tool geometry
* Interpret surface feet and chip load tables
* Tooling &work holding
* Machining sequence of operations
* Tighter tolerance considerations
* High speed tooling
* Efficient material removal
* Chip Control
 | **1/2****2/2****2/2****2/2****1/3****2/3****1/1****2/10****2/10****3/3****2/2** |
| **ASSESSMENT MEASURES** | * Check sheets
* Online tests
* Intermediate projects
* NIMS Credentials
 |
| **SUGGESTED KEY EXERCISES/****VIDEOS**: | * Electronic text books and media
* Making parts to specifications
* Tooling-U
 |
| **SUGGESTED KEY REFERENCES**: | * **Online data**
* **Text Books**
1. Machining and CNC Technology with Student Resource DVD, 3rd Edition/Michael Fitzpatrick
2. Technology of Machine Tools, 7th Edition/Stephen F. Krar & Albert F. Check
3. Precision Machining Technology/Peter J. Hoffman, Eric S. Hopewell, Brian Janes, & Kent M. Sharp Jr.
4. Machining Fundamentals, 8th Edition/John R. Walker
* **Reference Books**
1. Machinery’s Handbook, 29th Edition/Erik Oberg
2. Shop Reference for Students & Apprentices, 2nd Edition/Christopher McCauley
3. Machinists’ Ready Reference, 9th Edition/C. Weingartner, & Jim Effner
* **Online references** (Tooling U)
* **Phone App** (Machinists Friend)
 |