

## Lakeshore Technical College

31-420-326 Machining Geometry and Basic Trigonometry

# Course Outcome Summary

### Course Information

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| --- | --- | --- |
|  | Alternate Title | Apply geometry and basic trig to solve technical problems |
|  | Description | ...prepares the learner to apply geometry and basic trig to solve technical problems. |
|  | Total Credits | 1 |
|  | Total Hours | 32 |

Types of Instruction

|  |  |
| --- | --- |
| Instruction Type | Credits/Hours |
| Lab | 1/32 |

Pre/Corequisites

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| --- | --- |
| Corequisite | 31-420-325 Machining Math Basic |

Textbooks

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| *Mathematics for Machine Technology,* **Author:**Smith & Peterson **Edition:** 7th **ISBN:** 1133281450. **Source:** LTC Bookstore. **Required** |

Learner Supplies

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| LTC Machine Tool Operations - Math Study Guide. **Source:** Blackboard Course. (required) |
| LTC Math & Print Course Guidelines  **Source:** Blackboard Course. (required) |
| Scientific Calculator FX991EX Plus -SR. **Manufacturer:** Casio. **Source:** LTC Bookstore (required) |
| Access to a computer with internet connectivity |

### Core Abilities

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| --- | --- | --- |
| 1. | Use mathematics effectively | |
|  | Criteria | |
|  | 1.1. | Learner solves real world problems using mathematics |
|  | 1.2. | Learner measures accurately |
|  | 1.3. | Learner analyzes graphical information |
|  | 1.4. | Learner demonstrates an understanding of world measurements and foreign currency exchange |

### Program Outcomes

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| --- | --- | --- |
| 1. | Apply basic safety practices in the machine shop | |
|  | Summative Assessment Strategies | |
|  | 1.1. | in a performance demonstration in the machine shop or lab |
|  | 1.2. | in a written examination |
|  | Criteria | |
|  | 1.1. | Demonstrate safety procedures |
|  | 1.2. | Operate machine with all required guards in place |
|  | 1.3. | Maintain clean and organized work environment |
|  | 1.4. | Wear appropriate clothing and Personal Protective Equipment (PPE) |
|  | 1.5. | Demonstrate proper lock-out tag-out procedures |
| 2. | Interpret industrial/engineering drawings | |
|  | Summative Assessment Strategies | |
|  | 2.1. | in a performance demonstration |
|  | Criteria | |
|  | 2.1. | Interpret orthographic projections |
|  | 2.2. | Interpret lines, symbols, conventions and notations |
|  | 2.3. | Distinguish between structural shapes |
|  | 2.4. | Interpret a Bill of Materials |
|  | 2.5. | Determine location of part features according to established specifications |
|  | 2.6. | Calculate tolerances according to established specifications |
|  | 2.7. | Drawings follow view projection standards Interpret Geometric Dimensioning and Tolerancing |
| 3. | Apply precision measuring methods to part inspection | |
|  | Summative Assessment Strategies | |
|  | 3.1. | in a performance demonstration |
|  | Criteria | |
|  | 3.1. | Select correct measuring tool for job requirements |
|  | 3.2. | Demonstrate care of precision measuring equipment according to established procedures |
|  | 3.3. | Convert English/metric measurements |
|  | 3.4. | Use standard industry measurement terminology |
|  | 3.5. | Perform precision measurement according to established procedures |
| 4. | Perform basic machine tool equipment set-up and operation | |
|  | Summative Assessment Strategies | |
|  | 4.1. | in a performance demonstration |
|  | 4.2. | given an engineering drawing |
|  | Criteria | |
|  | 4.1. | Select and load tools according to the requirements of the job |
|  | 4.2. | Select and set up work-holding devices for specified operation according to established procedures |
|  | 4.3. | Verify machine set-up |
|  | 4.4. | Verify proper application of speeds and feeds |
|  | 4.5. | Operate machine tools according to established procedures |
|  | 4.6. | Complete project within specified timeframe |
|  | 4.7. | Complete an inspection document to verify print specifications Monitor machine tool operation according to established procedures and guidelines |
| 5. | Perform programming, set-up and operation of CNC Machine Tools | |
|  | Summative Assessment Strategies | |
|  | 5.1. | in a performance demonstration |
|  | Criteria | |
|  | 5.1. | Write basic programs for specified CNC machine tools according to EIA-ISO standards |
|  | 5.2. | Load the correct program into the machine |
|  | 5.3. | Verify the accuracy of the CNC program |
|  | 5.4. | Select, load, enter and verify work and tool offsets |
|  | 5.5. | Execute program Adjust speeds and feeds to optimize machining conditions |
| 6. | Perform advanced CNC machining operations | |
|  | Summative Assessment Strategies | |
|  | 6.1. | in a performance demonstration |
|  | Criteria | |
|  | 6.1. | Apply self-directed problem solving strategies |
|  | 6.2. | Perform advanced programming of CNC machines |
|  | 6.3. | Operate CAD/CAM systems |
|  | 6.4. | Control multi-axis CNC machines |
|  | 6.5. | Use computer aided metrology (CMM) |
|  | 6.6. | Perform one or more alternative CNC machining processes as defined by local industry needs. Record CNC Process(es) assessed: |

### Course Competencies

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| 1. | Solve equations by addition, subtraction, multiplication, division, and root and power principles. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 1.1. | Skillbuilder Exercise |
|  | 1.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 1.1. | learner submits the assignment. |
|  | 1.2. | you can solve equations using addition, subtraction, multiplication, division, root and power principles . |
|  | 1.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 1.a. | Solve equations using the power principle of equality. |
|  | 1.b. | Write comparisons as ratios. |
| 2. | Solve equations by rearrangement of formulas. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 2.1. | Skillbuilder Exercise |
|  | 2.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 2.1. | learner submits the assignment. |
|  | 2.2. | you can solve equations by rearrangement. |
|  | 2.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 2.a. | Solve equations involving several operations. |
|  | 2.b. | Solve for the unknown term of a proportion. |
|  | 2.c. | Set up and solve direct and inverse proportions. |
| 3. | Solve problems involving lines and angular measure. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Apply precision measuring methods to part inspection | |
|  | Assessment Strategies | |
|  | 3.1. | Skillbuilder Exercise |
|  | 3.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 3.1. | learner submits the assignment. |
|  | 3.2. | you can solve problems of lines and angular measurement. |
|  | 3.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 3.a. | Add, subtract, multiply, and divide angles in terms of degrees, minutes, and seconds. |
|  | 3.b. | Compute compliments and supplements of angles. |
| 4. | Solve unknown angles using angular principles. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Apply precision measuring methods to part inspection | |
|  | Assessment Strategies | |
|  | 4.1. | Skillbuilder Exercise |
|  | 4.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 4.1. | learner submits the assignment. |
|  | 4.2. | you can solve for unknown angles using geometric principles . |
|  | 4.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 4.a. | Identify different types of angles. |
|  | 4.b. | Determine unknown angles in geometric figures using the principles of opposite, alternate interior, corresponding, parallel, and perpendicular angles. |
| 5. | Solve angles and sides of triangles. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Apply precision measuring methods to part inspection | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 5.1. | Skillbuilder Exercise |
|  | 5.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 5.1. | learner submits the assignment. |
|  | 5.2. | you can solve angles and sides of triangles. |
|  | 5.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 5.a. | Identify different types of triangles. |
|  | 5.b. | Determine the unknown angles based on the principles that all triangles contain 180 degrees. |
|  | 5.c. | Identify corresponding parts of triangles. |
|  | 5.d. | Compute angles and sides of isosceles, equilateral, and right triangles. |
|  | 5.e. | Determine interior angles of any polygon. |
| 6. | Solve for the functions of angles given in decimal degrees and degrees, minutes, and seconds. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Apply precision measuring methods to part inspection | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 6.1. | Skillbuilder Exercise |
|  | 6.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 6.1. | learner submits the assignment. |
|  | 6.2. | you can solve the functions of angles. |
|  | 6.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 6.a. | State the ratios of the six trigonometric functions in relation to given triangles. |
|  | 6.b. | Find functions of angles given in decimal degrees and degrees, minutes, and seconds. |
| 7. | Solve for the angles and length of sides in a right triangle. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Apply precision measuring methods to part inspection | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 7.1. | Skillbuilder Exercise |
|  | 7.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 7.1. | learner submits the assignment. |
|  | 7.2. | you can solve for angles and sides of a right triangle. |
|  | 7.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 7.a. | Compute an unknown angle of a right triangle when two sides are known. |
|  | 7.b. | Compute an unknown side of a right triangle when an angle and a side are known. |
| 8. | Solve simple practical machine application problems. | |
|  | Linked Core Abilities | |
|  | Apply learning | |
|  | Demonstrate critical thinking | |
|  | Demonstrate responsible and professional workplace behaviors | |
|  | Use mathematics effectively | |
|  | Linked Program Outcomes | |
|  | Interpret industrial/engineering drawings | |
|  | Perform basic machine tool equipment set-up and operation | |
|  | Perform programming, set-up and operation of CNC Machine Tools | |
|  | Perform advanced CNC machining operations | |
|  | Assessment Strategies | |
|  | 8.1. | Skillbuilder Exercise |
|  | 8.2. | Written Test |
|  | Criteria | |
|  | Your performance will be successful when: | |
|  | 8.1. | learner submits the assignment. |
|  | 8.2. | you can solve practical right triangle problems with applied trigonometry. |
|  | 8.3. | learner completes the unit test. |
|  | Learning Objectives | |
|  | 8.a. | Solve simple machine technology problems that require the projection of auxiliary lines and the use of geometric principles and trigonometric functions. |