Engineering Department

EDDT 1500: Manual Machine Shop Theory

COLLEGE-WIDE LEARNING OUTCOMES

The Core Themes of SLCC's Mission focus on Access and Success, Transfer Education, Workforce Education and Community Engagement. As such, all courses and programs address one or more of the College-Wide Learning Outcomes below. Upon successful completion of any program at SLCC, students should:

· Acquire substantive knowledge in the discipline of their choice sufficient for further study, and/or demonstrate competencies required by employers to be hired and succeed in the workplace.

· Communicate effectively.

· Develop quantitative literacies necessary for their chosen field of study.

· Think Critically.

· Develop the knowledge and skills to be civically engaged, and/or to work with others in a professional and constructive manner.

COURSE DESCRIPTION

Basic machine shop theory including operation of lathes and mills. Process planning, part cost, and manufacturing improvements also covered.

Students will be introduced to basic machine tools, including manual lathes and mills, CNC machining and turning centers, etc., their nomenclature, and function. Various cutting tools and tool geometry,

common workpiece materials, and their interconnectedness with machining parameters will be discussed. Concepts of precision measuring and metrology will be introduced. Engineering documentation, tolerances, and thread forms will be taught.

Course Materials: No text required. All materials will be included in the Canvas site or provided to students in the lab.

COURSE FORMAT AND OBJECTIVES

The course uses a hybrid format in which online and face-to-face instruction and activities are reinforced by select machine shop experiences.

COURSE LEARNING OUTCOMES

To fulfill the goals of the College-wide Learning Outcomes, the following course learning outcomes of been established for this course. This course has seven primary learning objectives (referred to as competencies). Within each competency, there are multiple objectives.

· Suggest or implement improvements to improve the manufacturability of an existing design.

· Determine the most economical steps to produce parts manufactured in the machine shop.

· Calculate the cost of parts built in the machine shop.

· Utilize SPC to determine the stability of a process.

· Properly select and use metrology equipment found in a machine shop environment.

· Use proper machine shop terminology.

· Safely and correctly operate manual lathes and mills.

Grading: Students' grades shall be determined by their performance on 7 Canvas competency assignments, 6 lab competency assignments and a final reflective paper. Attitude and participation will also be factored into the final grade. Scores will be weighted, added, averaged, and rounded to the nearest full percentage point with the final course grade as follows:

| Letter Grade | Score |
|---|---|
| A | 93-100 |
| A- | 90-92 |
| B+ | 87-89 |
| B | 83-86 |
| B- | 80-82 |
| C+ | 77-79 |
| C | 73-76 |
| C- | 70-72 |
| D+ | 67-69 |
| D | 63-66 |
| D- | 60-62 |
| E | 0-59 |

GENERAL POLICIES

The following policies relate to this course. To view Salt Lake Community College Institutional Policies, Learning, and Support resources, and Advising and Counseling Support Services, click here.

**Syllabus**: This syllabus represents an agreement between the student and the instructor. It is designed to ensure course integrity and fairness as well as provide students with a clear understanding of course

expectations. The instructor and students are expected to use the syllabus and schedule as a guide for the semester. Any deviation from the syllabus or schedule will be discussed and agreed upon by the instructor and students.

**Attendance:** If class is scheduled to meet once during the first week, attendance at the first class meeting is MANDATORY. If class is scheduled to meet more than once the first week attendance at least one of the first two is MANDATORY. If you are absent on the mandatory days, you may be DROPPED from the course.

**Incomplete Grade and Withdraw from Class:** A grade of "I" (Incomplete) is the instructor's option and is not given except in the most extenuating of circumstances for which there is verifiable written documentation. In order to receive an incomplete, nearly all course work must have been completed (e.g. ~75%) with a passing grade. It is the responsibility of the student to drop/withdraw from this class, not the instructors.

**Academic Dishonesty**: Absolutely NOT tolerated and includes all forms of cheating and plagiarism as outlined in the Student Code. Penalty for first offense will be a grade of "0" on the assignment or exam; the second offense will be an "E" for the course.

**Electronic Devices**: Cell Phones, pagers, etc. are to be turned off during class. Computers can be used for notetaking and course-related purposes ONLY but should not be used during class for working on other tasks (e.g. answer emails, Facebook, other classes etc.). You will be asked to leave if your electronic device disrupts the class in any way. Cell phones MUST be turned completely OFF during exams.

**Classroom recordings**: Students may not record or publish information from the class without written authorization from the instructor. If used without authorization you have violated Privacy/Intellectual Property Rights.

Other SLCC academic policies may be found in the SLCC 2013-2014 Catalog, the Spring Semester Class Schedule and the Student Code of Conduct.

**Power Outage**: If the power goes out during class and the classroom becomes dark, class will move to areas of the building that have natural light or outside; class will not be canceled. If other classes have announced the cancelation of classes and you do not attend this class, you will be counted as absent,

and you may not be allowed to make up missing assignments and projects. Normally, power is restored within half an hour.

**Snowstorm or Other Weather Conditions**: If weather conditions are severe and you wonder if the College will be open, you can get timely and accurate information by calling the information hotline from home. (801-957-INFO or 801-957-4636). Information is posted on this hotline at 5:00 a.m. and updated throughout the day as conditions change. Also, during large storms, local TV and radio stations may provide information about school closures.

If you are not in class and the school has not been officially closed you will be counted as absent and you may not be allowed to make up missing assignments and projects.

**Building Evacuation**: The following points will be covered in class by your instructor when the syllabus is handed out. Make sure you understand each point. Ask your instructor for further clarification if needed.

· Classroom and building exits.

· Building Map.

· Use of elevators.

· Assembly location outside of the building.

· Individuals needing assistance during an evacuation

SCHEDULE:

Wk1 Syllabus, Safety, Lathe Nomenclature, Metrology, Gage Selection, SPC intro

Wk2 Metrology, SPC intro, SPC chart activity, facing preview

Wk3 Cutting Conditions, Feeds & Speeds Lab 1: FACING, review and inspection report

Wk4 Engineering Drawings, Gage selection, Tooling setup; qualifying a cutting tool, setting feed and speed, diameter cutting

Wk5 Test #1

Wk6 Thread Nomenclature Lab 2: DIAMETERS, review and inspection report

Wk7 Thread Tolerances Cutting chamfers, Lab 3: CHAMFERS, review and inspection report

Wk8 Fasteners, Tailstock operations

Wk9 Keys and Keysets LAB 4: DRILL & REAM, review and inspection report

Wk10 Test #2 Introduce final reflection

Wk11 Intro mill, Climb cutting, tooling, Mill Nomenclature

Wk12 Cutting tool geometry/capability Lab 5: SQUARING MATERIAL, review and inspection report

Wk13 Industrial chemical applications Lab 6: MILLING A BOSS, review and inspection report

Wk14 Recycling/sustainability Lab 7: DRILLING A HOLE, review and inspection report

Wk15 Lab 8: MILLING CHAMFERS, review and inspection report

Wk16 Final Test

**USHE Strand Alignment**

Machining2 EDDT 1500.pdf

Strands and Standards

Machining 2

Course Description

This course is the second in a sequence that will use technical knowledge and skills to plan and manufacture projects using machine lathes, mills, drill presses, and other equipment in safe working conditions to promote the manufacturing industries.

Strand 1

Student will participate in workplace readiness activities.

Standard 1 aligns Labs: Facing, Diameters, Chamfers, Drill and Ream

Perform basic trigonometric functions

· Solve for unknown sides

· Solve for unknown angles

· Calculate bolt hole patterns

Standard 2 Labs: Facing, Diameters, Chamfers, Drill and Ream

Calculate speeds and feeds for machining

· Given appropriate reference materials, calculate RPM for various metals and tools

· Given appropriate reference materials, calculate the proper feed for various metals, tools, and depths of cut

Standard 3

Locate basic machining points from a datum point Labs: Facing, Diameters, Chamfers, Drill and Ream

· Identify points using the Cartesian coordinate systems

Standard 4 Week 1 Lecture on Safety

Use PPE (personal protective equipment)

· Use PPE – personal protective equipment every lab

· Maintain and use appropriate protective guards and equipment on machinery every lab

STRAND 2

Students will be able to interpret engineering drawings and control documents

Standard 1 Week 3-7, 9-13 labs include drawings to be interpreted and followed, GD&T for inspection.

List the purpose of each type of drawing.

· Identify and describe the purpose of orthographic (three views) drawings.

Standard 2 introduced week 3, explained each week per lab drawings and Facing lab

Practice geometric dimensioning and tolerancing (GD&T) methodology

· Describe the purpose of GD&T

· Understand and demonstrate the use of basic GD&T symbols and functions

STRAND 3

Students will be able to properly measure and inspect parts according to drawing and document specifications

Standard 1

Apply proper measuring techniques Week 1 SPC and Metrology Lecture.

· Discuss factors affecting accurate measurement (dirt, temperature, improper measuring, tool calibration, burrs, etc.)

· Demonstrate the proper care and use of the surface plate

· Use surface plate accessories correctly (sine bar, gage blocks, etc.)

Standard 2

Accurately perform measurements Inspection after every lab

· If provided a calibrated micrometer, designed to read in .0001”, consistently take at least (4) different readings within the designed accuracy of the tool and numerically write each dimension. SPC assignment

· Measure features of a machined part using a height gage and accurately document those measurements

· Measure a hole diameter with a telescope gage and a calibrated micrometer of appropriate size and accurate document the measurement

· Measure features of a machined part using a calibrated caliper, within .001” accuracy and document the measurements correctly

· Measure a part for squareness. In at least 4 places and within a .002” tolerance

· Measure all part dimensions for accuracy with the specified tolerance range acceptable on print specifications.

STRAND 4

Students will be able to understand project planning, use hand tools, and recognize different manufacturing materials and processes.

Standard 1 Weeks 7 and 11, lathe and mill process planning assignments, respectively

Prepare and plan for machining operations

· Read and interpret blueprints

· Calculate proper speeds, feeds and depth of roughing and finish cuts for various applications

· Plan machining operations

· Plan for machineability and control chip formation

Standard 2 Week 9

Identify and demonstrate Proper use of deburring tools Week 9 and Lab 5 Squaring Material

· Proper care and use of deburring tools

· Select the most appropriate hand file and properly demonstrate its use

· Correctly identify and use abrasives

Standard 3 lecture weeks 2 and 8 with lab Drill and Ream

Identify common materials and explain basic properties

· Discuss the classification system for metals

· Describe general characteristics for carbon steels, tool steels, stainless steels, structural steels, cast irons, aluminum, and other commonly used metals

Standard 4 Introduced week 1, Safety, practiced each lab

Maintain a clean and safe work environment

· Keep work areas clean

· Clean machine and hand tools when work is completed

· Put tools away when work is finished

· Keep aisles clear of equipment and materials

· Perform preventive maintenance as required

· Understand Chemical hazards and the use of Safety Data Sheets (SDS)

· Keep storage rooms well organized and free of clutter.

STRAND 5

Students will be able to understand and demonstrate the use of milling machines

Standard 1

· Demonstrate proper use of a vertical milling machine milling labs 4,5,6

· Demonstrate the proper setup, operation, care, cleaning, and lubrication of the vertical milling machine Milling labs 4,5,6

· Correctly identify common cutters and explain their basic applications week 8 tramming assignment

· Properly dial in the vertical milling machine head within .001” TIR week 8 tramming assignment

· Accurately calculate speeds and feeds for a milling machine operation week 9 lab

· Demonstrate the proper setup and procedure for squaring a part week 9 lab

· Demonstrate the proper setup and procedure for hole work Week 13 Lab

· Demonstrate proper setup and procedure for using an offset boring head to bore a hole

· Demonstrate the proper setup and procedure for milling a slot or pocket week 11 pockets and bosses

· Differentiate between conventional and climb milling week 9 lecture and lab

· Demonstrate the ability to use the Machinery Handbook as a reference for technical information related to milling Process planning assignments, calculating feeds and speeds week 9

Performance Skills

· Use PPE- Personal Protective equipment. Done in every lab

· Maintain a clean and safe work environment. Done in every lab

· Each student should earn a score of 100% on a required safety exam relating to general shop safety and each tool he/she will be operating week 1 safety test

· Perform basic trigonometric functions assessed in Milling lab-drilling holes

· Calculate speeds and feeds for machining assessed in Lathe and mill process planning

· Locate basic machining points from a datum point assessed in Milling bosses lab

· Practice geometric dimensioning and tolerancing (GD&D) methodology assessed in labs squaring material, cutting bosses, and hole drilling labs for vertical mill

· Accurately perform measurements with hand-held instrument assessed in Metrology lab, part inspection after labs 1-6

· Accurately perform measurements on a surface plate assessed in Lab 1, Inspection after lab 5 bosses milling

· Demonstrate proper use of hand tools assessed in Deburring tools, labs 4-6

· Identify Common materials and explain basic properties lecture weeks 2,8 and selecting workpieces prior to each lab

· Demonstrate proper use of a vertical assessed in milling machine labs 4-6